AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 8, No. 6. WEEKLY. | NEW YORK, FEBRUARY 7, 1885. | $2.50 per Annum. SINGLE COPIES, 5 CENTS.

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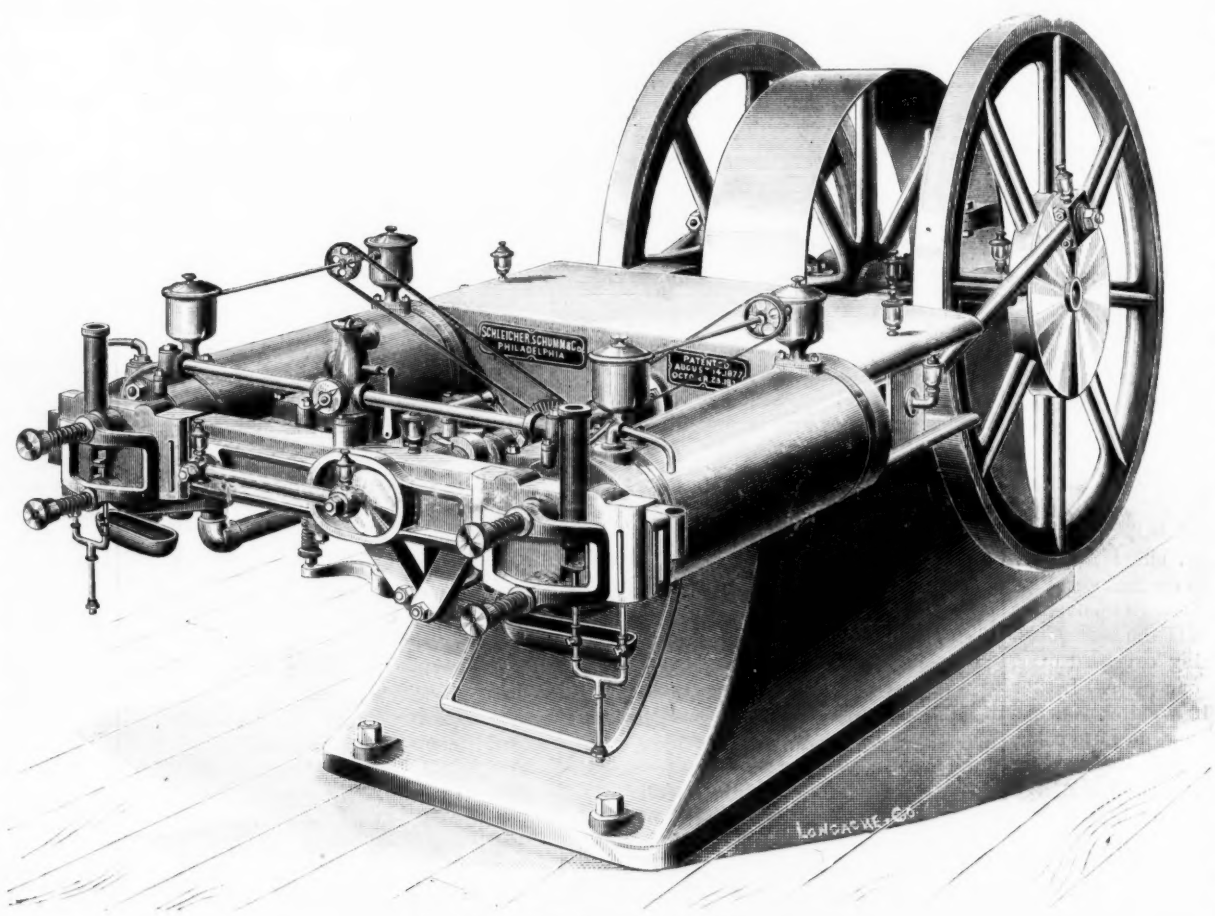
The "Otto" Two-Cylinder Gas Engine.

For the ordinary purposes for which gas engines are used—developing but a few horse-power—the single-cylinder engine, from its simplicity and the ease with which it can be managed by unskilled attendants, is found to be very satisfactory. But in localities where gas is furnished at moderate prices, as in England and other European countries, the tendency is to the use of larger gas engines, those of 100 horse-power being sometimes used. This tendency to use gas engines of larger sizes has led to modifications in construction, in which the aim has been to secure other valuable features, while sacrificing the desirable feature of simplicity as little as possible.

The engraving on this page represents a new gas engine brought out by Schleicher, Schumm & Co., of Philadelphia, manufactured in sizes over 15 horse-power only. In this engine an impulse is given at every revolution of the fly-wheel when running at full power, which gives a steady motion. Special advantages are also claimed for it when partly loaded.

The governor controls the speed by admitting gas to one cylinder alone until the full power of that cylinder is exerted, after which, for further power, the second cylinder begins its work. The arrangement is such that, while the right-hand cylinder draws in a charge the left-hand cylinder is doing work, and while the left-hand cylinder exhausts combustion gases, the right-hand cylinder compresses the charge for the subsequent ignition. With both cylinders the action of the governor is such as to prevent undue and subsequent increase of speed, because there is no charge to be admitted to the cylinder and exploded after the governor has cut off the supply, as is the case with engines having a separate pump.

The combination of two standard "Ottos" under control of one governor secures the same economy in gas consumption as in the other form of these engines, and provides for regularity of motion under full or partial load, and freedom from destructive jars and shocks. We are informed that in a test of one of these engines, rated at 25 indicated horse-power, it was worked up to 30 horse-power, developing 24 horse-power on the brake. The consumption of gas is guaranteed to be less than 21½ feet per indicated horse-power per hour. As previously noted, these engines are not built double except in larger sizes; but, where considerable power is required, this combination is recommended as giving more satisfactory results than a single engine, while there is but little complication of parts to bring about desired results.



THE OTTO TWO-CYLINDER GAS ENGINE.

Making Cold Chisels.

BY JAMES F. HOBART.

Years ago the machinist appreciated a good cold chisel. He had to do all his heavy planing and shaping with them, and he took care to have the best and keep them in shape. If a man was going to chip the teeth of a big bevel gear, in order to remove the scale, he would be pretty apt to look around for the very best cold chisels he could get hold of, and then he would keep them sharp.

When you make a cold chisel, get a good quality of octagon cast steel. It is a pretty good rule "to sample all the tool steel that comes into the shop and make cold chisels of the samples." If steel will stand the cold chisel racket, it is good enough for any tool. Our grandfathers used to test all their new steel by drawing a piece of it down to an eighth of an inch square, and then taking a very strong heat, in fact, burning the extreme end. Then they cooled and broke in pieces with the hammer. They had a chance to see just how much heat it would stand without getting "rotten," also at what heat it would harden, and whether it would spring in hardening.

Nobody knew then what a piece of steel would be like until he had tested it. It "might harden, or it might not." Now-a-days you get the same brand from the same maker, and are reasonably sure of getting the same steel, but there is a difference, as the tool maker often knows to his sorrow.

Don't try to draw steel to smaller sizes in hope of improving the chisel by "hammering." "Hammered" steel now-a-days, when that hammering is done by the smith on his anvil consists of "more talk than cider."

The old chaps long ago used to improve the steel of their time by judicious working and hammering, but tool steel of to-day is so homogeneous that I would rather take it in the bar than after the smith has "monkeyed" it. Don't try to work a cold chisel too cold. There is a saying that the "devil gets the smith who hammers cold iron, or hot steel," but don't hammer a cold chisel after it is cold. You may hammer it enough to get hammer marks out, but don't try to draw cold steel.

I have seen smiths heat a drill or chisel for about ⅜", and then strike 300 pound blows to draw the steel, just back of the hot place. It causes terrible strains in the chisel, and if a fire crack comes in and about half the width of the chisel breaks off, they pitch it into the scrap heap, or tail-race and cuss the man that made "that poor steel."

Everybody writes in the papers against heating steel too hot, or "burning it," but half the trouble with cold chisels is caused by too little heat. A cannon will be destroyed in time by the action of blows struck by the exploding powder. How long would one last if it were put under a big 100 ton steam hammer and struck hard enough to disarrange the structure of the iron or steel? You would not have to fire it many times after such treatment before it would "let go" and kill at both ends.

Heat steel as hot as it will bear, and work it while hot. If you wish to work ⅞" of the end of a chisel, do the heating back of where you intend to hammer. Heat an inch and a-half of the tool. It takes a trifle longer, but you can work it much better. It will hold the heat and work easy.

Don't try to temper a chisel with the remains of the forging heat. Use a fresh heat for tempering, and heat enough to harden. Leave all tempering "medicines" for somebody else; if you cannot get a temper with good fire and water, you have mistaken your vocation, and had better try some other track.

When tempering cold chisels, or any other steel articles, heat to a very dull red and rub with a piece of hard soap, then finish heating and harden in clear, cool water. The potash of the soap prevents the oxygen of the atmosphere from uniting with the steel and forming rust or black oxide of iron. The article will need no polishing to enable the colors to be seen. This will be appreciated when tempering taps, dies, or various complex forms not easy to polish.

Never "upset" a cold chisel. It is sure death to the steel. Many of us have lived on a farm and know something about a bundle of nice, straight, clean straw. If you work it intelligently you can tie it up into stout bands for binding other bundles. You can take hold of the ends of that straw and draw out a handful without harm to the straw. After you have drawn out half that bundle a foot or so, try to drive it back; every blow breaks the straw, cripples and doubles it up, and it will hardly bear its own weight, to say nothing of making a band for other bundles.

Just so with steel. If you have a broken chisel to sharpen, draw out and cut off, never upset. It will cripple the fibers just as the straw is crippled when driven endwise.

Make chisels short for hard, rough work. They transmit the power or force of a blow much better. Long chisels are apt to "broom up" on the hammer end, as the long steel through which the blow passes, has more chance to absorb the force of the blow.

The harder the metal to be worked, the quicker the blow should be transmitted. Cast iron works much better with a short steel chisel and light hammer, than if the blow was struck upon a very long chisel with a heavy wooden mallet. In one case the blow is delivered "all at once," in the other it takes time, and much of the force is absorbed.

Marble workers desire a "slow" blow. The material is very hard and would seem to require a quick, sharp stroke, but they do not wish to chip off little chips, they wish

the chisel to act as a wedge and split off long pieces shaped like gun flints, so they use slender chisels and soft mallets.

Brass chipping needs a special rig too. It does not break off like cast iron, but the chips must be forced up gradually as by a slowly driven wedge; so take a long chisel and use a big hammer, and strike slow, lazy blows.

If the head of a chisel "brooms up," don't forge it into shape again, but grind off the steel that curls over. Never harden the hammer end of a chisel. It is a nasty trick. The first thing you know, a piece of steel will fly and strike your hand. It will cut where it hits, no matter whether it strikes hand, face or eye. Keep the chisels nicely ground. One end needs grinding as much as the other.

In cutting tough, deep cuts, don't be afraid to use oil; dip the chisel every blow or two. It prevents its binding in the cut and breaking off a corner of the chisel.

Never spend your time in using a crooked chisel. It is only a promoter of profanity. If you cannot straighten it, then keep it to lend.

Chisels with handles are the things for heavy work. You can make a chisel 2½" long, and pound on it with a sledge hammer without danger to your fingers or feelings.

Never put an eye in this class of chisels; it weakens them just where they need strength, and they will "squat" at the eye, or break in two altogether. Forge two small grooves in each side of the chisel, put it in the vise, heat a ⅜" iron rod and wind around once. The folds will come in the grooves and prevent the chisel from slipping out. Slip a link or ring over the ends of the rod and you have a handle that won't break off, and a chisel with no eye to break. When you wish to remove the chisel to sharpen, just knock off the link, spread the coil a little by opening the handles, and the chisel will drop out.

We cannot tell what "color to draw to" when letting down temper. We don't know, neither does anybody else, until he has worked the steel. If it works easy and appears rather soft, it is safe to assume that it will stand a harder temper than if it took two blows of the hammer to make one dent.

I have used the hot sand bath and melted lead for drawing temper, but I must acknowledge that I like an open charcoal fire the best. Hold the article high up over the fire—just above the flame is the best place. Keep it in motion, turning over and over, and never hold still in one place. Let the temper down slowly. If a chisel, you can get half an inch of the point down to color. If you run it down quick, the extreme point only will possess the right temper, and if it gets broken off a little it will be too soft after grinding out. Taps, tempered slowly, work much better than those which are drawn upon the jump. It requires a perceptible time for steel to conduct heat, and if sufficient time is not given it will be apt to contain hard spots, and off comes your tap just when you least expect it.

There is not much use either in wasting space on tempering. Everybody has got the best way and won't use any other. And as for learning to temper steel by reading how, you might just as well try to neutralize the effects of boarding-house hash by swallowing a treatise on dyspepsia.

The only way to make good chisels that I am familiar with is by the use of a little "gumption" and lots of experience.

If you are in doubt about how much temper certain steel will stand, try but little at first, and the chisel can be repaired with half the labor that would be required if it had been too hard and crumbled.

Car Builders and Science.

On the evening of their January meeting, the members of the New York Car Builders' Club wrestled with the subject of car heating and ventilation.

To the uninitiated in the mysteries of car construction, it would seem that a proper comprehension of all the requisites of successful car heating and ventilation, involved considerable scientific knowledge. The practical men who attended this meeting appeared to think otherwise. Inventors of special ventilating devices were freely denominated humbugs, and a speaker, who by the way, was inventor of a car ventilator, described scientific men as "fellows who wore long hair and slobbered their food round while eating."

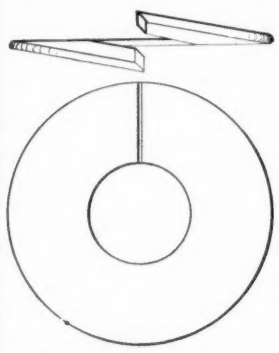
If the sentiments expressed by the few car builders present at this meeting represented the views of railroad managers, the tendency of the present time is to throw aside all so-called scientific methods of ventilation, and go back to the movable sash. The death-dealing car stove was left without a word of reproach.

Expired Lock-Nut Patents.

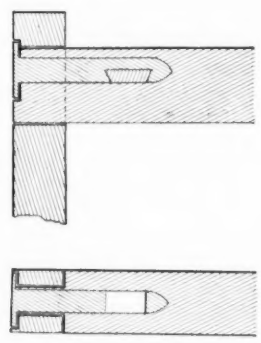
BY F. B. BROCK, WASHINGTON, D. C.

The following designs for lock-nuts have all expired, with the exception of the Shaw lock, which will expire April 28, 1885.

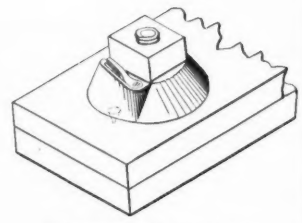
The invention of Thomas Shaw, of Philadelphia, consists in shaping an ordinary washer so as to spring or bind against the head of the bolt or nut. The washer is cut diagonally through on one side by a shear, and the taper edges or ends thus formed are sprung apart, as shown in the drawing.



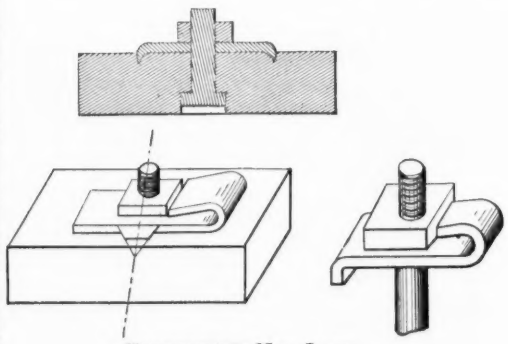
SHAW'S NUT LOCK.



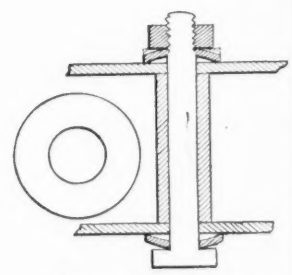
JEWETT'S NUT LOCK.



HICKMAN'S NUT LOCK.



ELLSWORTH'S NUT LOCK.



COLLINS' NUT LOCK.

This washer is made for use in connection with right-hand screw threads. It will be observed that the taper or diagonal cut on the washer is in the direction to permit the nut to revolve freely over it when the bolt is being tightened; but it will not revolve so freely when it is turned back, as the taper cut edges of the washer catch upon the surface of the nut, and upon the material through which the bolt passes.

This nut-lock washer is very efficient when used for bolting wood, or wood and iron, as the edges of the washer take more readily into the surface of the wood, and prevent any loosening movement of the nut.

An ingenious bolt-lock was designed by S. E. Jewett, of Haverhill, Mass. The patent expired this year.

The Jewett bolt is adapted to be locked without the use of the nut or thread on the bolt. The bolt has a portion of the metal cut away, forming at its end a dovetail-shaped opening. This space is to be filled by a segment of wood correspondingly dovetailed into the metal.

When the bolt is forced home glue is applied to the segment of wood, which securely retains the bolt in place against any ordinary amount of force.

A lock-nut washer designed for socket bolts in steam boilers, is the subject of a patent granted Jos. G. Collins, of Boston, and which expired last spring.

In the use of socket bolts in the water legs of steam boilers, in order to prevent leakage, it is common to employ a flat washer which has had a portion of the metal removed from one side of the central hole in the form of a countersink, the latter being filled with cement in a plastic state which hardens by application of heat.

The Collins washer is made concavo-convex, as shown in the drawing, and in some instances the convex side is made plane. The outer edge only of the concave washers comes in contact with the plates, leaving a large space between the washer and plate for the reception of cement, so that a sufficient quantity may be used to make tight work under all circumstances.

The washers should be of sufficient thickness to prevent their being crushed by the nuts.

In 1867, G. G. Hickman, of Coatesville, Pa., devised a washer for a bolt, the patent for which expired last September.

Embedded in the face of the washer is a spring, which by engagement with the edge of the nut prevents its becoming unscrewed until the spring is depressed. Underneath the washer is a brad, or spur, which protrudes into the object against which the washer is clamped by the nut.

This nut is said to be secured against accidental unscrewing by jars, or the common incidents which tend to loosen it. The spring is a piece of pliable metal attached to the washer by a screw or rivet, its free end giving way to the revolution of the nut in screwing down, but opposing its edge to the unscrewing of the nut. The washer is of considerable thickness, and the brad on its under side enters a hole formed in the surface against which it is screwed, to prevent its being turned around with the nut.

The last nut-lock here considered is that made by Edward A. Ellsworth, of Washington, the patent for which expired the third of December.

The washer consists of a single flat plate of metal, having one of its sides turned up as shown, and provided with two downward projections, which rest against the bar of metal or wood so as to preserve the washer in a stationary position with respect to the bar.

The upturned end of the washer, which forms a spring, is possessed of a certain amount of elasticity so that when lifted up by any proper means, to admit of the nut being turned in either direction, it will when released assume its former position.

Mr. A. Eisenacher, machinist in charge of the tool room in the N. C. Railroad shops at Elmira, N. Y., sends us a sketch of a piston remover very much like that which we illustrated in our issue of January 10. The tool is described as being exceedingly convenient and effective for the operation of removing pistons. It is rather larger than the tool we illustrated, and is capable of exerting a pressure of 40,000 pounds. Axle steel is used in making this piston remover.

The annual meeting of the American Institute of Mining Engineers will be held in New York city, beginning Feb. 17th.

Last of the Fontaine Locomotives.

It has been known for the last year that the two Fontaine locomotives would soon be sold for scrap metal or for reconstruction into ordinary locomotives. The sale has lately taken place, and the engines were sold to the Lake Erie & Western Railroad for $2,700 each. These engines were built four years ago. Their design violated well-known principles of mechanics, and their success depended on a defeat of the law of virtual velocities. The friends of the scheme backed their views by expending $45,000 on building two locomotives. Old Nature proved too strong for the Fontaine locomotives when they were put to trial, and zeal and money could not conceal the fact that they were the worst kind of failures. The railroad company that gives $2,700 for each of these engines has not got much of a bargain. Scarcely any part will be available for turning into an ordinary locomotive, except the boiler and cab.

We should have reckoned a good new locomotive at $7,500 the better bargain.

Invention of the Cotton Gin.

The Associated Press dispatches recently forwarded the startling intelligence from Columbia, S. C., that it would be proved by the South Carolina exhibit at New Orleans, that H. Holmes, a native of South Carolina, was the inventor of the cotton gin, and not Eli Whitney, to whom the honor of that invention is generally accorded. The news gatherer who got up that dispatch is not so well informed on the history of the cotton gin as a good many school boys are, or he would not have burdened the telegraph with the romance he sent. Hogden Holmes' invention was well known to be one of the numerous piracies on Whitney's cotton gin, and it was brought out six years after Whitney's great invention was in successful operation.

The State of South Carolina paid Whitney fifty thousand dollars for the right to use his cotton gin, an act which did the State great credit at a time when all the other cotton-raising States availed themselves of the benefits of the invention without paying the inventor a cent.

No single inventor ever conferred such sudden prosperity upon a State or region as the invention of the cotton gin conferred upon the South.

Within fifteen years several of the States were elevated from a condition of industrial penury and financial poverty to riches, comfort and prosperity.

It is too late now to begin filching the honors from the great inventor whose genius effected this beneficent revolution. The riches made by the cotton gin went to the cotton-raising States; Whitney received no share of the opulence resulting from his invention. It is then cruel to attempt to rob his name of the empty honor.

A Gigantic Iron Tower.

A project which, if executed, would render the Paris Exhibition of 1889 for ever memorable, has been published by M. Eiffel, the French engineer, and is described in *La Nature*. It is to erect in the grounds of the exhibition an iron tower 300 meters (nearly 1,000 feet) in height; that is, twice as high as the Great Pyramid, and more than twice the height of Strasburg Cathedral. One hundred and sixty meters he considers as the limit of height possible in a structure of which stone is the principal material, and hence iron is proposed. The base of the

tower is of pyramidal shape, and is to be 70 meters high, and the superficial area at this height will be 5,000 square meters; above this there are to be three other stages, or stories, in which will be rooms which it is proposed to use for various purposes, scientific and other. The towers of Notre Dame will be mere pigmies beside this colossal structure, and will not reach to its first floor. The projector points out that, in addition to its monumental character, the structure will be useful for strategetical purposes in war time, on account of the vast range of view, for meteorological and astronomical observations; for at such a height the clearness of the air and the absence of fogs would render observations possible which cannot be made on the ground. The tower might also be used for the electric light. The whole exhibition and the surrounding neighborhood might thus be lighted from a central point. Many scientific problems may, it is suggested, be investigated from the tower, such as the resistance of the air to different weights, certain laws of elasticity, the study of the compression of gas or vapors, of the oscillation of the pendulum. In shape it is to resemble an enormous lighthouse, gradually tapering from a wide base to the summit.

John F. Allen's Stationary Riveter.

This riveter is operated either by a pressure cylinder or by belt and gearing.

The improvements consist, first, in the application of a toggle joint between the driving gear, or the pressure cylinder, and the ram, whereby, by a small cylinder of about 13 inches diameter, a pressure (at 60 pounds steam pressure on the piston) of about 50 tons will be brought upon the rivet. At the same time, by the use of the toggle joint at the end of the stroke or at the finish of the head, the die in the ram will remain longer upon the just finished rivet head, thereby giving it some time to cool, more than is the case where the ram is worked by a crank or cam arrangement. The driving gear on the cylinder is placed in the hollow box-shaped main frame.

Secondly, the improvements consist in a peculiar screw arrangement in the head of the end stake, whereby a pressure of from 5 to 10 tons, automatic and changeable at will, is brought in combination with the ram against the plates, to press the same together before and during the operation of forming the rivet head.

In the illustration, Fig. 1 shows a side elevation of this riveter, operated by a belt and gearing; and Fig. 2 represents the compression arrangement in section. The arrangement and operation of this compression device is as follows: *N* is a sleeve provided with a suitable screw thread, *V*, working in a nut, *M*, turning freely in the end stake *B*, and secured in its place by the cap *P*. *L* is the central end die, securely fastened stationary in the end stake, upon which the sleeve, *N*, is allowed to move horizontally in suitable feathers, *z*, attached to the die *L*. The nut, *M*, is provided with teeth, *m*, on its outer end, into which the teeth of a wheel, *v*, fast to a shaft *p*, engage. To the other end of this shaft, wheel *R* is attached, around which a cord, *S*, is placed, having a weight, *W*, at its end.

When the ram *H* is moved outward, it comes over the head of the rivet and against the plates, and moves the same against the end of the sleeve *N*, forcing them inward, thereby throwing a pressure against the joint of the two plates equal to the force required to turn the nut *M*, as the sleeve *N*, moving on the feathers *z* in the stationary end die *L*, is prevented from turning.

The end of the sleeve *N* projects sufficiently beyond the outer end of the end die *L* to bring this pressure against the plates before the end of the rivet comes in contact with the end die *L*, or with the cavity in the same which forms the head, thus throwing a pressure upon the joint before the rivet head begins to be formed; then gradually recedes or is moved inward while the rivet head is formed, thereby retaining the same pressure against the joint during the operations of forming the rivet head.

This force or pressure thrown against the plates before and during the operation of forming the rivet head, depends upon the pitch of the screw thread *V*, upon the moment of the weight *W*, and also upon the relation of the gear wheel *v* and gear *m*, as the combination and proportions of these parts cause the nut *M* to turn more or less freely; hence, by varying any or all of these parts, the resistance opposing the rotation of the nut *M*, and consequently the amount of pressure exerted against the plates or joint (which is equal to the force required to turn the nut *M*), can be easily regulated.

When the ram *H* recedes or moves backward, the action of the weight *W* turns the nut *M* so as to move the sleeve *N* outward, until its end projects the desired distance beyond the end of the end die *L*, ready for the next operation, making thereby this arrangement perfectly automatic.

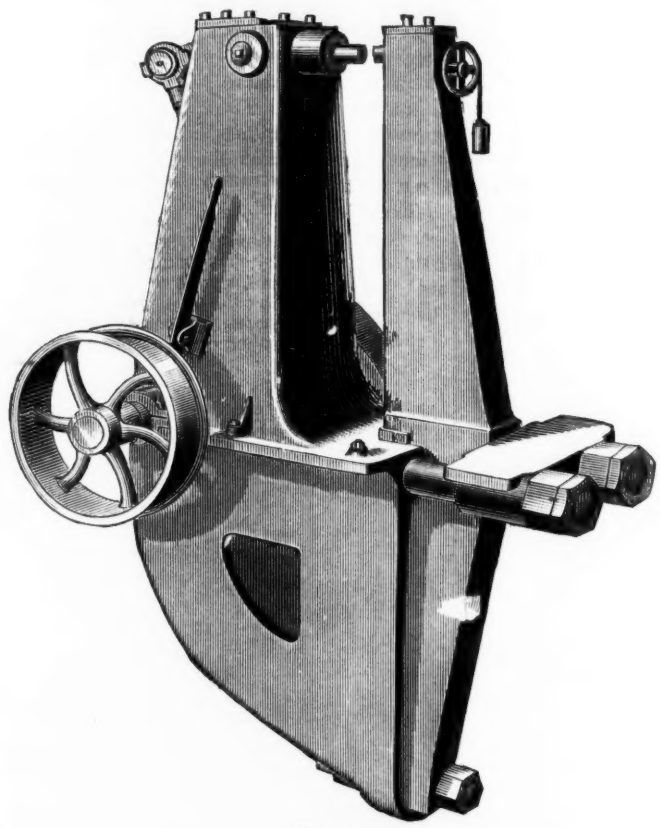


FIG. 1.

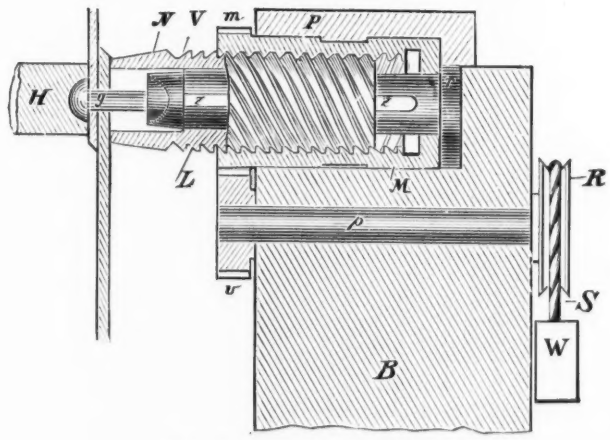


FIG. 2.—STATIONARY RIVETER.

This riveter is designed for the heaviest description of work, such as boilers having 1″ steel plates with 1¼″ rivets, and for a reach of 72″.

The box frame is 44″x27″ at the base, made of gun metal; and the end stake is 26″x7″, of wrought iron. The bolts to hold the end stake to the main frame are 4¾″ diameter, and the moving ram is 5″ diameter, having 4″ motion, which, together with 1¼″ motion of the sleeve, gives 5¼″ between the dies.

These machines are built by the Allen Riveting Machine Company, Henry E. Roeder, manager, 82 and 84 Nassau Street. Some of them are already in use, and their operation is highly spoken of, for the quantity of work they will perform, and for the satisfactory character of the work, as well as for the ease with which they are manipulated. Mr. Allen, the inventor, has had extended experience with this class of machinery.

A Chinese Rope Factory.

Some time ago Wilson & Roake, machinists and engineers, Dover and Water streets, New York, contracted to build a large rope-making factory in China, and equip it with all the necessary machinery. Mr. Wilson went out to China to superintend the work, and he has recently sent home photographs of the factory, which show a handsome building that has been put up with a view to suit the climate and in a way that will make future extensions easily executed. The building stands at the base of a steep hill, and is located at Kiluneal on the mainland opposite Hong Kong. The views show the native Chinese dwellings scattered at random over the hillside, and very rough, tumble-down habitations they appear to be. The roughness and squalor apparent about the Chinese homes stand in bad contrast beside the neat order around the rope factory.

The factory is 200 feet wide by 100 long, and is fitted up with all necessary spreading and laying machinery. There is 400 feet of main line shafting driven by a Corliss engine 16x36 inches. The whole plant of machinery that was taken from New York weighed 556 tons, and many things needed in the factory were made in China. This included the boilers for steam making which were made by native boiler makers from drawings made in New York. All the help employed is Chinese, and Mr. Wilson says they work very well but slowly. He thinks the boiler-makers are much superior to the machinists as workmen, but the latter are skillful enough to do all the required work. Connected with the factory is a machine shop equipped with all necessary tools of the latest design. The skilled help required for the rope-making operations is taken from men who learned the work in Tubbs' rope factory, San Francisco, from which they were expelled by the crusade against Chinamen, led by Dennis Kearney & Co. Mr. Wilson lived for eleven years in China, leaving there twelve or thirteen years ago. On returning there a year ago, he was surprised to find the changes and indications of progress that had occurred during his absence. This rope-making factory, he thinks, is merely part of the beginning of a movement to apply machinery and Western methods and improvements to operations previously done by hand labor alone. Hemp can be bought in dock there for 6½ cents a pound, and workmen whose labor for that process is just as good as Caucassian labor, can be hired for about $8 a month. This makes production of rope so cheap that there is a probability of the finished article coming in competition in Europe and America with ropes made from higher priced material with high priced labor.

Scraps—No. 7.

BY J. G. TRAMIS.

A study of the relations between architecture and machine designing, and the application of the principles which underlie good architecture applicable to the designing of machinery, may be both interesting and instructive.

In the early days of machine designing in this country, the only people who could make drawings that would be of use to machinists were architects. From this fact it may be readily understood why so many of our costly machine tools were endowed with such strong architectural characteristics.

Had the architects incorporated in the machinists' plans more of the principles underlying the foundation of architectural science, and omitted the architectural embellishments, they would have done a better thing.

There is this one broad principle that is at the bottom of all successful buildings—*purity of style*—which must sooner or later be recognized in machine designing. Purity of style does not need a very long definition to render its application to machine work understood.

In the Greek work the cross sections of the mouldings were irregular curves; in the Roman, sections of true circles. In the Roman work the arches were semi-circular; in the Gothic, pointed. In nearly all noted buildings the same characteristics exist throughout, and designers of machinery will find it a fact worth remembering.

In no pure architecture does the member pretend to do anything except that which it does do, and is capable of doing. The column supports the entablature, has the appearance of supporting it, and, if it does not appear to be strong enough, something is out of proportion. If the column itself has not only a sufficient foundation, but one that appears sufficient—that is, if the column rests upon some concealed support—it is poor architecture.

In the machine the support must not only be ample, but, to give satisfaction, it must appear ample. Nothing can be added to or taken away from a Doric column that will make it look better, and nothing can be added to or taken away from a Tuscan column that will make it look better; they are perfect of their kind. So, too, nothing can be added to or taken away from the post of a Bement shaper, or, what is the same, the Brown & Sharpe milling machine, and make it better; it is perfect of its kind, and, so far as machines that grow out of the single column as the central support deviate from this model, they fail in attaining perfection.

The same characteristics that are employed in one part of a machine, either as supporting framing or style of finish, should be used in all parts which are of the same character. If a part of the frame be of the H or I section, all the other parts will harmonize better if they be of the same H or I section; and so, too, if on the rectangular, round-cornered, cored section. If round corners be adopted, let that finish prevail through

out—moulding on post giving way to clean, graceful curves—and they add to the appearance of the machine for the same reason that the mouldings add to the building—*they are appropriate.*

A machine may be grand as well as a building, but gains that effect from the embodiment of principles entirely different from those which contribute to the grandeur of a building. Every grand building depends for its grandeur upon one of two ruling characteristics: either a long-continued repetition of one single element—and is grand to look at as is a large army of well-drilled soldiers—or the building has one noble central feature, like a spire or dome, with minor spires or domes looking up to it. Both of these are features the machine cannot possess, but constructively its different parts should grow out of its one central body or frame, and so become noble as a tree is noble, and grand from the grandeur of its movements and workmanship.

It is not possible for the architects of this age to produce work comparable to that of the ancients, but now is the time for the designers of machinery to make themselves the ancients for future generations.

Maudsley and his pupils — Whitworth, Roberts and Nasmyth, in England; Corliss, Porter and Leavitt, in engines; Bement, Sellers and Couch, in machine tools; Richards, in wood-working machinery, and a few others, will, I believe, in years to come be called the old masters.

Some machines seem to reach near perfection, while others seem to disappoint even the best of those who have attempted to deal with them. It is doubtful if any one has ever been satisfied with the architecture of a slotting machine, although it seems almost identical with that of the band-saw or sewing machine, and yet the Grover & Baker people mastered the one and John Richards the other. So why cannot some one solve the problem of producing an acceptable design for a slotter?

The detrimental influence a poor design has on a well-invented machine is likely to be under-estimated.

I well remember a new and popular machine tool, built thirty-five or forty years ago, and sold at the rate of from twenty-five to fifty a year. The working parts of the machine were very similar to and about as good as the standard machine of its class to-day. It was built upon a square column, as are some of its class now, and yet the sales do not average five per cent. of machines sold by other builders, or ten per cent. of what it was on the start. And all this falling off is due to adhering to the old pattern, which was at the height of the architectural fashion of its day—a square column, with heavy moulded base, panel sides, and wide display of cornice. The old pattern has probably been patched up enough to have made three new ones, and perhaps the designer still believes it the best design ever evolved.

When we want a design for a new building, we employ an architect, and, if we have had much experience, we employ one who has made a success of that class of a building which we propose to erect. But if we contemplate building a drilling machine, we consider ourselves equal to the task of beating Mr. Bement himself.

I wonder if we shall ever have sense enough to do in machine designing as we do in architecture—employ a man who has made a success of that specialty.

The Indicator Diagram.

BY F. F. HEMENWAY.

DIAGRAMS FROM AN AUTOMATIC, AND FROM A THROTTLING ENGINE.

Fig. 34 was engraved from a pair of diagrams sent me with the following data: Cylinder, 18″x48″; revolutions per minute, 73; gauge pressure, 80 pounds; vacuum, 26″. They show excellent valve setting—all that could be desired in that respect to produce good diagrams. Boiler pressure is not realized in the cylinder by about 11 pounds, which is too much loss, generally speaking, but the piston speed may have been increased beyond the intentions of the builder. If the diagrams represent the average load, the piston speed is too high. Somewhat less speed would bring about less expansion, and result in a larger percentage of boiler pressure being realized in the cylinder.

The horizontal line next above the vacuum line represents the pressure due to 26″ vacuum, and shows the back pressure due to the steam getting out of the cylinder to have been very moderate. There is a small amount of compression, probably as much as can be conveniently had. A little earlier opening of the exhaust might very slightly decrease the back pressure at the beginning of the return stroke, but there is very little, if any, room for improvement in this respect. So far as a casual examination of the diagrams goes, they would be pronounced very fine ones from an engine a little underloaded.

Applying the calculation for the *steam* accounted for by the indicator, and it is found, for diagram B, to be only between 11 and 12 pounds per indicated horse-power per hour—very conclusive evidence that something is wrong. The clearance is not known, but I have assumed it to be, as represented at *C*, three per cent. of the displacement of piston, which is undoubtedly correct to a fraction of one per cent. On this assumption of clearance, on diagram B the isothermal curve has been drawn from a point near the end of the expansion curve. This shows that about 8 per cent. more work has been done than would have been done by the steam present at exhaust opening if it had expanded on the isothermal or Mariotte curve. On diagram D this curve has been drawn from a point, *X*, about one-sixth stroke; its termination is about 2½ pounds higher than that of the curve traced by the indicator pencil.

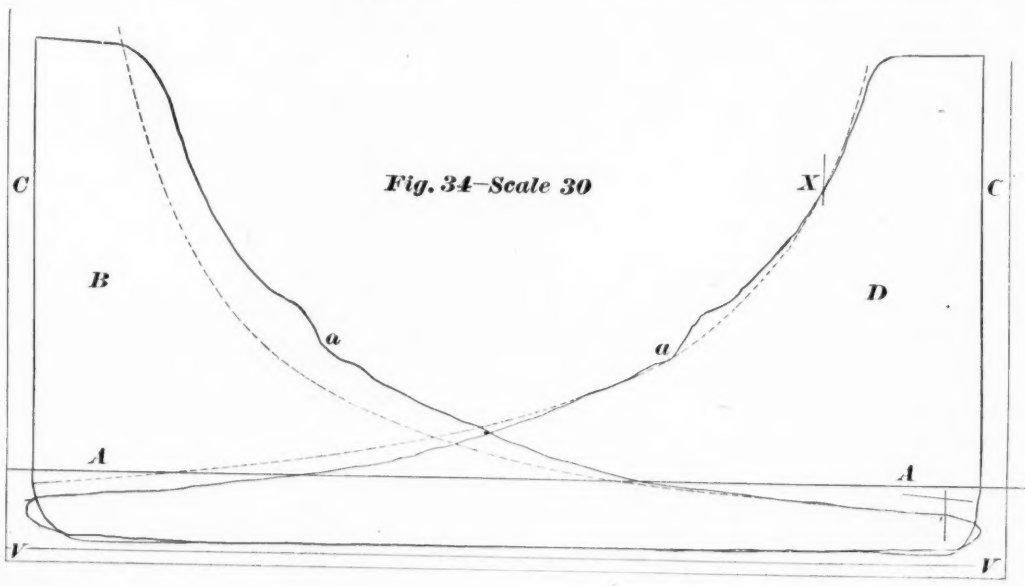


Fig. 34—Scale 30

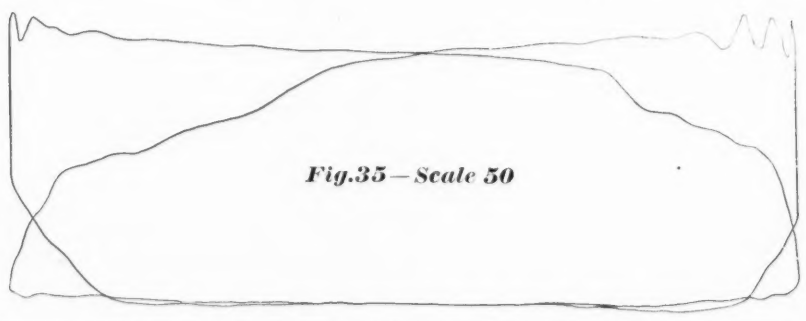


Fig. 35—Scale 50

It will be noticed on this diagram (D) that from *X* the actual curve is above the theoretical to a point in the stroke represented at *a*. This would have been even more noticeable had the theoretical curve been drawn from a point still earlier in the stroke, where, according to the indications of the diagram, the point of cut-off should be located. Beyond *a* the actual curve falls below the theoretical, very rapidly at first, then less rapidly as the pressure diminishes.

From the peculiar characteristics of these diagrams, I should conclude that, although the steam valve nominally closes at a point in the stroke considerably before *X*, it is not fairly seated until a point in the stroke represented at *a*; that up to that time leakage into the cylinder had been going on, as shown by the actual expansion curve being too high; and that leakage out of the cylinder was taking place all the time, as indicated by the real expansion curve rapidly falling away from the theoretical curve beyond *a*. The falling away of the expansion curve is less rapid near the end of the stroke, because there will be less leakage as the pressure diminishes, because the volume is increased so that the effect of a given leakage is not so noticeable, and because there is more re-evaporation towards the end of the stroke.

It may be said that the clearance has been wrongly assumed. If it is considered that there is no clearance, the same characteristics, in a slightly modified degree, will be found.

Again, it may be said that the expansion is better than represented by the isothermal curve. Admitting that this is so (although it is not probable), and drawing the adiabatic curve on the diagram, with no allowance for clearance, it will be found the diagram represents more work than would be done by the steam present at exhaust if expanded on that curve.

The conclusion seems to be warranted that either the exhaust valves or piston, or both, leak, and there is strong probability that the steam valves do not seat promptly at cut-off.

Fig. 35 is one of several diagrams taken at a recent trial of an agricultural engine, built by the Springfield (Ohio) Engine and Thresher Company. It is interesting as representing the hard work engines of this class, as at present constructed, are capable of. In no other class of engines has greater progress been made within the past few years. This is one of several sets of diagrams taken during a test of some hours' duration, and shows not only remarkably high initial pressure for a throttling engine, but also a high mean effective pressure for continuous work. The engine has a plain slide valve; cut off by lap. The following particulars are abridged from the record of the test: Engine was run at a speed of 208 revolutions per minute, speed controlled by a Tabor governor. The average mean effective pressure for the entire run was 58.023 pounds, corresponding to 23.15 horse-power. The average steam pressure was 82.8 pounds, and the average initial pressure, measured at a point on the diagram representing nearly one-quarter stroke of the piston, was 72.8 pounds—only 10 pounds below boiler pressure. The speed showed a variation of only two revolutions—less than one per cent.—between the engine running light and fully loaded.

The points of cut-off, release, and exhaust closure are well defined on the diagrams. In such engines, when worked hard, something is always sacrificed in the way of back pressure to maintain draft. This accounts for back pressure being higher than if the exhaust were not choked for this purpose.

It will be observed that the cut-off is later on one end than on the other. This is due to the fact that the valve is not equalized.

LETTERS FROM PRACTICAL MEN.

Electrical Transmission to a Distance.

Editor American Machinist:

An article in the issue of the AMERICAN MACHINIST for January 17th on the uncertainty of electrical transmission in New York demands a little attention from our department of engineering. The idea that there is any uncertainty about carrying an electric light current two miles is, of course, absurd, but there may be readers of the AMERICAN MACHINIST who do not know the true inwardness of carrying an electric current to a distance, and who will, therefore, think there is great loss therein. They may think the loss is very uncertain and not understood by electricians. This is all wrong, and might do our science some damage.

We *know* just what energy would be used up in a circuit two miles long, just as well as a machinist knows how much power is used in a line of shafting. We know more about it in fact, as we can easily determine all the data for calculating the work in such a circuit.

We know that a loss of eight lights in a circuit two miles long is entirely wrong, and the "electrician" (so styled) who permits it, is a disgrace to the profession. Probably, if the whole facts were known, that electrician could explain the situation so that the absurdity of losing so much power in such a short circuit would be entirely removed, and the cause of the loss properly located.

Let us hope he will give the details of the installation so as to enable us to decide where the fault is.

There are hundreds of electric light circuits in this country over two miles long, and not a single practical one in the lot using over one light for each two miles of wire. Different systems use different quantities of electricity, and consequently different sizes of wire, so that one cannot tell just how much loss there should be without knowing the size of the wire and the quantity of electricity used. Most electric light circuits use one lamp in every 2½ to 3½ miles of wire. This loss is quite constant, the variations between wet and dry weather, or cold and hot weather, being very slight. If the variations were anything more than slight the poor fellows who have charge of electric light plants would be in constant trouble, whereas we do not make any calculations for change in circuits. The weather will affect the working of an electric lamp that is good enough to have any "affections." These conditions we watch and arrange for, but the circuit is a constant factor.

There are two factors to a current of electricity, just as there are to a current of water. If I say that a million gallons of water pass my door hourly and ought to be used for power, an engineer would smile and say, "How much 'head' has it?" He cannot figure the power of a current of water without knowing the "quantity" and "head." We cannot figure the power of an electric current without knowing the "quantity" and ("head") electromotive force. If we know the resistance of the wire and the "quantity" of electricity passing, we can tell what force is necessary, and, by multiplying the quantity and the force together, we get the power or work done in the circuit. Our science being new and peculiar, we have new and peculiar units for measuring the "stuff" we handle, but these units bear a certain relation to the mechanical units in use.

If this two-mile circuit under examination was made of wire mostly used for electric light circuits, and the quantity of electricity that of most systems of electric lighting, there would be $\frac{6}{10}$ horse-power of energy

used up, which is a little less than that of an electric lamp.

To put this in the language of a modern electrician: "Our unit of quantity is called an ampere; our unit of resistance is one ohm, and our unit of electromotive force is one volt."

If the circuit was of No. 4 copper wire, there would be a resistance of 4.34 ohms.

Most systems use a current of 10 amperes. To send a current of 10 amperes over a circuit of 4.34 ohms, requires a force of 43.4 volts.

The quantity—10, multiplied by the force, 43.4—gives us 434 units of work. There are 746 units of work in one horse-power, so we have $\frac{434}{746} = .581$ horse-power.

These figures are given, subject to the approval of electricians generally, to show that we know how to estimate the work in a given circuit, and that any notions to the contrary are erroneous. We should have the benefit of the factors thoroughly known, as well as in other departments of engineering, and a paper that goes to men not versed in the science should not give false impressions thereon. GEO. CUTTER.

Bridgeport, Conn.

Inside Lap of Valves—Experience in Firing a Locomotive.

Editor American Machinist:

I notice in your issue of December 27 a communication from Frank Hill on exhaust lap, and also in January 10 one from "Reverse Gear." I do not agree with either of them. My experience, although not extensive, has been that a little inside lap has given better results for traction and portable engines at ordinary speed, which is usually about 200 revolutions per minute.

In the first traction engine in my charge I found the same trouble as Mr. Hill found. I thought the engine was blowing, and was using more fuel and water than was necessary. Before starting again the next season, I gave it a general overhauling; found that the piston had been blowing some, and there was no lead on the valve. I gave the valve considerable lead, after which I found quite a saving in fuel and water. In most instances, in running threshing engines, there is no chance for obtainlng accurate data, so the most of it is guess-work; that is, we generally judge by the day's work in the season. My experience is that some seasons I use less fuel and water, and average more bushels of grain per day. The reason is the straw is shorter, season drier, and it threshes from 5 to 15 per cent. easier. Experienced horse-power thresher-men by the score will testify to this, and I am inclined to think that is where Mr. Hill's saving came in.

As for "Reverse Gear," speaking of his experience out in Dakota, they "do work an engine for all it is worth" out here. But why do you fellows that come out here always lay the extravagance of fuel and water to valve not being properly made? It is the valve or the cross-head—always the manufacturer's fault. The manufacturers must be a very ignorant class of men. Of course, grangers—moss backers—don't know all about the scientific workings of the valve gear proportions, best point of release, effect of lead, how to handle, how to line up, etc.

An engineer out here, with coal $10 per ton, doesn't want to be caught napping or proportioning valve gear. We have to be careful in our firing, and not waste much steam at the safety valve. There is many an engine that blows the engineer's wages out of the escape valve, and I don't refer exclusively to portable and threshing engines either.

In 1872 I commenced firing on the Chicago & Northwestern. The engine was a wood-burner, long haul, heavy grades. The engineer was one of those good-hearted, careless fellows who never knew how much steam he was using, and cared less. Why I was put on this engine I never knew, unless I was deserving of some punishment. The engine was a Baldwin, 16x24", not in good order.

The engineer handled the throttle, and I the wood—some days nine and ten cords, and four days in succession fourteen cords, of oak and maple. The wood was all charged to us by measurement, for which we had to give tickets at each yard. There was nothing to do but "get there, Eli." On arriving at the foot of a hill the pump must go on full head, for the water was always low at that point; lever hooked in the corner, steam go down, shut off pump, water get low, then link up and pump her full. It was a terror.

After a few weeks she was run in the round-house two days for light repairs, and went out with a new engineer. He went to work as though he wanted to earn his wages. He says, "We will experiment a little. You see the water in the glass, you will always find it at that point. I will save all the steam I can; you save all the wood you can, and keep the steam at the proper pressure by the use of door and dampers." Fixed the door to shut tight. No more coming into stations with escape valves wide open. Firing was sport. We did the work with six or seven cords of wood per day, and had the best monthly record on the division.

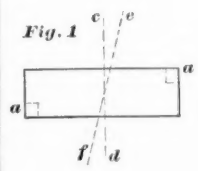
NORTH DAKOTA.

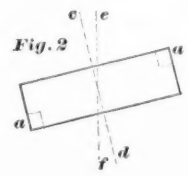
Balancing Revolving Bodies.

Editor American Machinist:

The criticisms of Prof. C. H. Peabody, on the above subject, in the AMERICAN MACHINIST of Jan. 10, 1885, seem to be premature, or there has been an oversight in the representation of the subject.

He says, if the pulley is not properly balanced, say that there are equal masses arranged as at a and a, Fig. 1, then the pulley, when revolving freely, will take the position shown by Fig. 2, its axis of rotation, $e\,f$, being inclined toward a and a. This is his idea as expressed, though not quoted *verbatim*. The statement, that $e\,f$ is the axis of symmetry of mass, is subject to contradiction, but as no definition of "axis of symmetry of mass" has been given, we will not discuss this point.





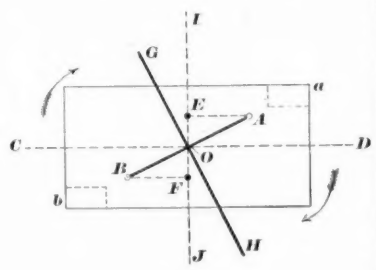


Fig. 3

Referring to Fig. 3, let us take the example given, viz.: a pulley which is heavy at a and b, then the center of gravity of the *right hand half* of the pulley is at A, off one side of the center line $C\,D$, toward the *heavy* side a. Likewise the center of gravity of the *left half* of the pulley is at B, on the side of $C\,D$ toward the *heavy* side b.

Now, if the pulley is constrained to revolve about the axis, $I\,J$, then it is evident that there will be a centrifugal couple whose arm is $E\,F$ (supposing the weight acting at A to be equal to that acting at B), and the moment of this couple will be the centrifugal force acting at A (or B) multiplied by the arm $E\,F$. This tends to turn the pulley in the direction of the arrows until the line $A\,B$ is at right angles to its *constrained axis*, and it will then revolve about its *natural* axis $G\,H$, at right angles to $A\,B$. While revolving about $G\,H$, the pulley will not tend to change its axis, since the moment of the centrifugal couple is zero in this case.

The conditions of perfect equilibrium in revolving bodies may be briefly stated thus: The resultant of all the *centrifugal forces*, and the resultant of all the *centrifugal couples* acting upon the axis of the revolving body *must be zero.*

This is substantially the same as the conditions stated in the pamphlet referred to by Prof. Peabody. Hence we see that the *natural axis of rotation* is inclined *from* the heavy sides a and b, Fig. 3, instead of being inclined "toward" them as represented by Prof. Peabody in Fig. 2.

The "statement of the pamphlet" in regard to pounding, as illustrated in Fig. 3 (Vol. 8, No. 2, page 5, AMERICAN MACHINIST), is ambiguous, as it does not state whether the "pounding" has reference to the pulley itself, or to the bearings of its shaft.

PAWTUCKET, R. I. C. A. SMITH.

Mr. G. S. Strong on the Joy Valve Gear.

Editor American Machinist:

I have just read, with some interest, in your issue of January 17th, a letter from David Joy of London on his valve gear. In answer to his assertion as to having invented everything that is embodied in his patents and specifications, and also in my combination of parts which I claim as improvements on this class of gear, I would say that, I have been convinced for some time and now am positive, and assert without fear of successful contradiction, that David Joy is not the original inventor of anything claimed by him in his patent or otherwise, and I have documentary evidence to prove this assertion. All that he has done is to make combinations of other men's inventions. I am in a position to defend myself and patrons in the use of the gear which we are now using, and prefer to settle it in a court if Mr. Joy is so disposed, and for that reason shall not inflict your readers with my evidence, but am acting advisedly in what I am, and propose doing. As to the merits of Mr. Joy's gear, I have nothing to say but to re-assert what I said before, that it was not suitable for the purpose for which I wished to use a gear, and the experience of the Reading Road had not been such as to encourage the Lehigh Valley Road to think anything could be done with it, and to say that if Mr. Joy had invented a gear identical with the one patented by myself, why did he and his agent persist in trying to introduce the gear with radial arm which he has for the last eighteen months, after having failed to introduce the one with sliding block in this country, both of which were very weak and objectionable, and why did not Mr. Joy, when asked by Mr. Bromly of the South Eastern Road in England, not produce some gear worked wholly from true centers suitable to the engines then running on that road and to new engines, and not abandon it after months of effort in that direction, and why other failures on account of wear on sliding block in South Africa, and other places, the Reading Road included?

Now, as to my acting in bad faith with Mr. Joy, I first met Mr. Joy at Newcastle-on-Tyne, in 1881, and was introduced to him as the inventor of that class of gear, where I also met Charles Brown, who was also introduced as the inventor of very similar gear, and who I have since learned deserves much credit for his development of this class of gear. I became acquainted with both gentlemen without thought of business with either, as, at that time I had not commenced my investigations relating to locomotives. I afterward met Mr. Joy in London, and was invited to his house, still without any thought of business, but one never knows in England what hospitality is intended for, but according to American ideas it is not intended to put one under personal obligation. I afterward, at Mr. Joy's request, visited his office in London, and something was said in regard to my taking up his gear and introducing it in the United States, and we had some correspondence in regard to it, but without anything definite being arrived at, all of which ended without my being consulted in the appointment by Mr. Joy of another party as his agent, by which action I considered myself released from all obligations of a confidential nature, and free to act for myself, which I have done and am going to continue to do, and although separated from the fountain head, I think I will succeed.

GEO. S. STRONG.

[So far as we are concerned this ends the discussion as to the validity of the patents in question.]

Fuel Economy with Locomotives.

Editor American Machinist:

In the AMERICAN MACHINIST of July 5th, is an article entitled "Fuel Economy with Locomotives," by Angus Sinclair, in which he compares the average locomotive of this country with the same kind used in England. He states that on an average a freight engine in this country, drawing its load, burns 120 lbs. of coal per mile, while an engine of the same class doing the same work on one of the English roads consumes only 50 pounds of coal. A comparison between passenger engines is 63 lbs. per mile in this country, to 30 lbs. for English engines.

Now, in the first place, is it possible for a locomotive to burn 120 lbs. of coal in about three minutes, and again, does not the American locomotive compare favorably with any other in the world? Has it not received the highest award at foreign exhibitions?

The writer goes on to give some of the reasons for the immense difference in fuel consumption, such as losses at the safety valve, and non-attention to regulating draft, etc.

Now, Mr. Editor, it is evident that the causes enumerated cannot possibly make the difference mentioned, *i. e.*, two and a half times as much coal consumed in this country as in England. I think if the writer will investigate the matter a little further he will find that the difference is to be accounted for mainly in the quality of coal used in both engines, and not in the design and workmanship of the two different locomotives.

I think it is safe to say that our locomotives are as good as any in the world.

Upon conversing with an intelligent engineer, he informed the writer that in crossing the ocean, that if coal was used from this country in making the passage across, and coal used from England for the return voyage, that it was mere play to keep the fires agoing in the latter case as compared to the former. E. C. HAINES, M. D.

WOODSTOWN, N. J.

[The figures given in the article Dr. Haines refers to are correct. Locomotives do burn 120 pounds of coal in three minutes when heavily worked. American locomotives compare very favorably with any in the world except in fuel economy, and some American locomotives that are particularly well managed make as good mileage per ton of coal as any locomotives in Europe, but this is exceptional. The coal used by American locomotives appears to have as high thermal efficiency as the average English coal. In a report of experiments made to test the evaporative power of coal from different places, that is published in Appleton's Cyclopedia of Applied Mechanics, the English coals are shown to have evaporated 8 58 pounds of water, and the American coals 10 34 pounds. ANGUS SINCLAIR.]

Straight Castings.

Editor American Machinist:

I read Mr. Hultgram's article, in your issue of January 24, with interest, but cannot agree with him that the castings named would be straight when cast with equal thickness of sides, D and E, without weighting the casting at each end before being cooled off. I think he has some doubts about their being straight, as he says "the castings would probably have been practically straight."

Having had considerable trouble in casting water tables for brick buildings (in imitation of cut stone), for the benefit of your readers I would say that the surest way to get a straight casting is to exercise judgment in the making of the pattern, by simply making the pattern crooked, or convex, sufficient to become straight when cold.

GEORGE E. STAUFFER.

East Stroudsburg, Pa.

Horton Lubricating Device.

This device was designed by the inventor for use with a moulding machine, manufactured by the company with which he is connected, the Howard Patent Metallic Brush Company, 48 Washington Street, Boston, Mass., but is applicable to the bearing of any upright shaft or spindle, whether running fast or slow. The oil is supplied through the cover in the box, filling the chamber and oil-ways, and finding its way to the bottom of the bearing. When the spindle is revolved, the oil, in a way that will be clearly understood, is forced along the spiral groove in the shaft, and is thrown off at the top into the oil chamber to again flow to the bottom.

The operation is to keep a constant circulation of oil by the bearing surfaces as long as the shaft is in motion. At the lower end of the bearing a suitable packing is provided, to prevent the escape of oil.

The object is not to make a bearing that will hold a large quantity of oil, but to insure perfect distribution of a moderate quantity.

A Good Locomotive.

Indicator diagrams, taken by Mr. Harris Tabor from a Pittsburgh locomotive running on the Terre Haute and Indianapolis Railroad, show a mean effective pressure of 116.7 pounds, with 130 pounds boiler pressure. This is almost 90 per cent. of the boiler pressure, and is higher than anything we have ever before seen from a locomotive. The engine giving this record has cylinders 18 x 24 inches; steam ports, 18 x 1¼ inches. The valve has 5 inches travel in full gear, has ⅞ inch outside and ⅛ inch inside lap, and is set with $\frac{1}{16}$ inch lead in full gear. All through the tests the engine showed remarkably good steam distribution, and an ample boiler gave a high record of water evaporation to coal consumption.

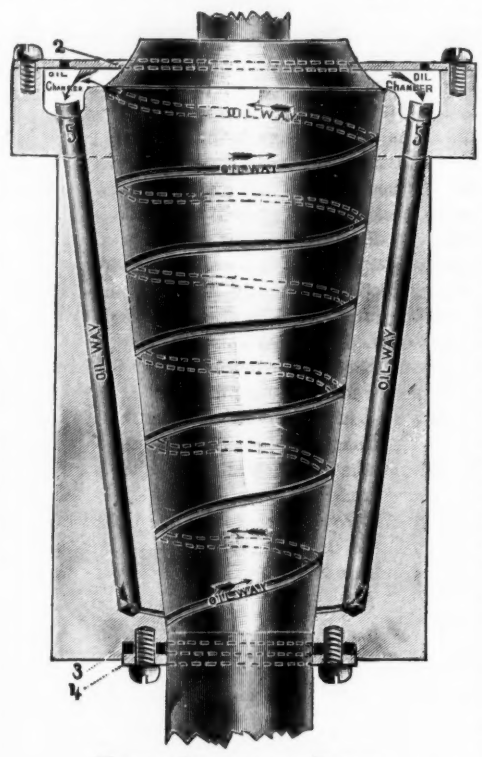
More Frequent Payment of Wages.

In his recent annual message to the Legislature, Governor Robinson, of Massachusetts, said:

"In the inaugural address delivered a year ago, I urged upon the favorable consideration of the Legislature the justice of the appeal made by wage-earners for more frequent payment of the compensation for their labor, and endeavored to set forth substantial reasons in its behalf. Though the subject was examined at great length by the appropriate committee and was fully discussed, no relief was granted. I cannot, however, regard the issue closed or the agitation fruitless; and without presuming upon your patience by a repetition of the arguments in support of the desired legislation, I must not fail to express my conviction in the wisdom of requiring corporations to adopt a practice in this regard which will surely bring greater independence, readier means, more general contentment among those whose labor is their only capital, and without whose welfare, whatever the advancement of all others, the State can never reach its highest degree of prosperity and power. Several of the chief employers of labor have voluntarily taken the initiative in the adoption of the reformed system, and demonstrated its feasibility and efficiency. No argument, however subtle or forcible, urging the impolicy of such action, or the inconvenience or expense of frequent payment, answers the logic of necessity which those feel whose toil day after day only suffices to keep soul and body together, and whose whole earnings in a year do not exceed in dollars the number of working days. It is manifestly for the interest of the commonwealth that the laborer be relieved to the utmost of the unavoidable burdens of the credit system, the costs and vexations of petty suits, and an enforced dependence upon the will of others for opportunities to change his employment, or to avail himself of the other advantages that may contribute materially to greater freedom and success."

The Groesbeck Car Ventilator.

Mr. David Groesbeck, New York, has invented a ventilator for railway cars which we consider by far the most efficient device ever produced for the purpose. The invention works on the same principle as the injector, yet the ventilator is designed in such a simple fashion that it operates automatically, without any supervision from train men. With this device on a car, there is no necessity for opening windows or doors for the admission of fresh air, for the ventilator can be regulated to admit sufficient air to change the atmosphere of car every half minute or every hour, with easy graduations between these extremes. The apparatus consists of an oblong case made of galvanized iron, with open ends, which extends across the car under the roof. On each end of this case a bell mouthed attachment is fastened, which on one side is set open towards the engine, and at the other side towards the rear of the train. An opening on top, which is covered with perforated tin, of this case admits air into the car in the quantity needed, while the surplus supply shoots over and comes out at the other side, carrying out any water or dust that may have passed into the opening. When the train is running in one direction, the ventilating device acts to force air into the car, and in the other direction it acts to exhaust out the air. The patentee is now putting this ventilator on one of the Wagner drawing-room cars. It has been in use on the New York, Lake Erie and Western Railroad for over a year, and works admirably.



HORTON LUBRICATING DEVICE.

Adjustable Stocks and Dies.

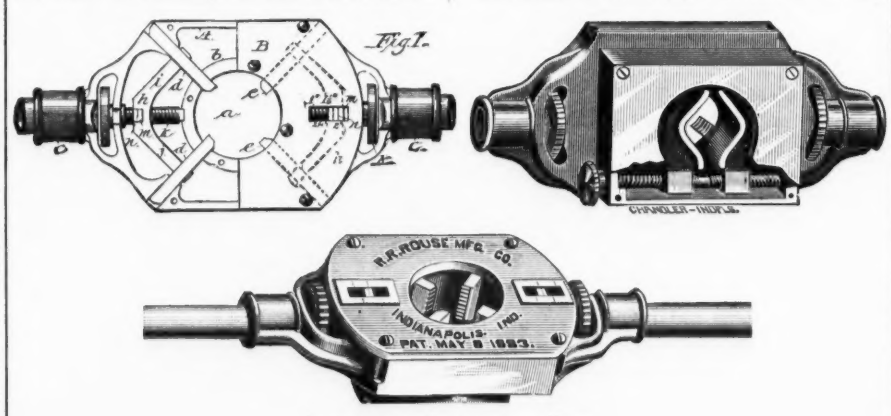
The stocks and dies illustrated herewith are made by the R. R. Rouse Manufacturing Company, 16 Cortlandt Street, New York.

They are provided with an adjustable bushing, which fits any size pipe to be cut.

The dies are adjustable, one set of dies cutting, for instance, 1", 1¼" 1½" and 2" right-hand threads, being adjusted by means of graduated set screw wheels; then, by changing the dies end for end, the same threads, left hand, can be cut.

The adjustable guide can be adjusted to fit over a coupling or socket, so the dies will cut close up to the socket.

It is so constructed that chips cannot get in to bind or clog the dies.



ADSUSTABLE STOCKS AND DIES.

American Mining Machinery in Mexico and Central America.

At the last meeting of the American Institute of Mining Engineers, Mr. F. H. McDowell, New York, read a paper on the above subject, of which the following is an abstract:

For more than two hundred years Mexico has been enriching the world from her inexhaustible wealth of precious metals. From this source alone over three thousand five hundred millions of dollars have been poured into the coffers of Europe and America.

During these centuries the wants of the country in manufactured goods have been supplied from the mills and machine shops of the Old World. English, French and German merchants in Mexico have vied with each other in their efforts to control the importing of these goods from their respective countries. The overthrow of Maximilian, the departure of the French, and the restoration of the republic, largely influenced by the strong stand taken by the United States Government during our own civil war, established a new order of things.

Americans were encouraged to visit the sister republic, examine into the needs of the country, as well as its resources, and interest themselves in the work of development. More recently, under Presidents Diaz and Gonzales, liberal inducements have been extended to American capitalists to build railroads, open mines, erect reduction works, raise cattle, and improve the crude systems of agriculture. The Mexican Central Railway has been pushed south from the Rio Grande to the capital, and, by its branches and connections, makes the whole mineral belt of the country accessible.

The reciprocity treaty, approved at the last session of Congress, will shortly be ratified by the new Mexican Congress, and a fresh impetus will be given to American enterprise in Mexico.

The millions of money which have already been invested are but the beginning of that movement, which will not cease until Mexico has taken that position among the American republics to which her mineral and other resources justly entitle her.

The relations between the United States and the States of Central America are steadily becoming closer; and the commission, lately appointed at Washington to visit the country, examine into its resources, and report a plan to secure a more extended interchange of products, is likely to open new channels for the introduction and use of American manufactures and the capital necessary to develop Central American industries.

To secure the machinery trade of these countries, it is necessary, first, to make a careful study of the local conditions under which machinery must operate, and then see to it that no weak or merely experimental devices be allowed to find their way into the new market, to the injury of both maker and user.

As such machinery will be largely used in the mining of ores and the extraction of the metals, I propose to discuss briefly in this paper the character of the machinery which has been used in the past, as well as that which is now being used for these purposes.

The early drainage of the Mexican mines and the removal of ore to the surface was accomplished by cheap peon labor and over pole-ladders, until an increased depth and flow of water made mule whims and rawhide ropes and sacks essential to further workings. While these will eventually be replaced by steam hoists and Cornish pumps, many years must elapse before a genuine revolution in this direction can be effected. Foreign countries have introduced the improved appliances to a limited extent, but the native mine owners will cling to the old system as long as possible.

For the treatment of ores, however, a much greater interest is being manifested in the American methods. Those of the old Spaniards still in force are crude and laborious, but, as the results have proved, very effective. Wherever it was possible to carry on smelting operations, either through the lead present in the ore or by the addition of litharge, this was the process preferred.

With the rapid encroachments upon the sources of lead and fuel, amalgamation became more generally adopted.

The native furnaces now in use are very crude in construction and limited in capacity, the blast being supplied by man, mule or water-power. The resulting lead bullion is remelted in a *vasa*, built of the same material (*adobe*) as the shaft furnaces, and the litharge is broken up into a new charge to increase the percentage of lead, the silver being still further refined and cast into bars for shipment to the mints.

The water-jacket furnaces, which have been introduced by American companies, are of the type so favorably known throughout our Western States and Territories, where they have largely increased the bullion output. Those giving the best satisfaction are located sufficiently near to the railroad to insure a regular supply of coke.

For amalgamation, the ore is broken by hand to the size of a walnut or egg, crushed to powder by the Chilian mill (stone rolls, revolved by mule or water-power), and finally reduced to pulp in *arrastras* (the simplest form of stone grinding mills). Where the ores are free milling, the *arrastras* are frequently used for amalgamation also. Refractory ores go to the *patio*, and are worked over repeatedly by hand or by driving horses through the heaped-up pulp. This operation requires from one to five weeks, according to the season of the year; chemicals being added with quicksilver from time to time until the whole is ripe for washing, when it is removed in regular charges to the settlers. These are commonly deep wooden tubs, into which is run a stream of water. Natives wade through the pulp, up to their necks in mud, gradually separating the earthy matter from the amalgam. The former runs off, while the latter is collected and retorted, the distilled quicksilver being used over again, and the silver cast into bars. Particularly rebellious ores go through the roasting furnace before reaching the *patio;* but this is avoided wherever possible, on account of the high price of fuel.

So much of the labor of treating ores by these processes devolves upon mules and horses that one of our most eminent mining engineers has said that the price of corn controlled the cost of all the mining and metallurgical operations of the republic.

To design machinery to accomplish the same results with much greater economy and dispatch would appear to be a very simple matter, until the complicated conditions under which it must operate are considered.

Many mining camps are accessible only on foot or horseback; the machinery, in such cases, must be made in light sections for

mule transportation. In some districts fuel cannot be obtained; here we are obliged to utilize mule or water-power. In others, where fuel can be obtained and water for steam is abundant, the quantity of mineral and organic matter held in mechanical suspension, or in solution, is so great that boilers scale and deteriorate very rapidly. In still others, owing to the altitude, the difference in temperature between the days and nights, the bad water and food, and the small number of foreigners present in the mining districts, it becomes a difficult matter to retain competent mechanics. Most of the mines are located so far from the base of supplies in the United States that long delays can only be prevented by carrying a very complete stock of supplies. Machine shops being few and poorly fitted up, a little repair room connected with each plant becomes an almost essential feature.

It remains, therefore, to study the conditions of each locality for selecting or designing the machinery best adapted to the work in hand. This should not only be extremely simple in construction and operation, but readily repaired in case of wear or accidental breakage. Wherever possible, the prominent features of the native appliances should be copied, mules, water or steam being simply substituted for hand-power. In this connection, it would be well to note the historical fact that our system of amalgamation is largely a natural outgrowth of the old Spanish system, modified to meet the requirements of our times.

In no other way can the labor of the country be gradually educated up to a full appreciation of the advantages to be conferred by the use of modern mechanical devices, and a sudden revolution avoided. It is by natural and easy gradients that the native mill-men can be carried from hand-crushing and Chilian mills to the California stamp, the Cornish rolls, and the crushing machinery of more recent construction.

While the latter are gradually encroaching, and with reason, upon the domain of the stamp in this country, that device has played so important a part in our metallurgical operations, and has become so thoroughly established at all our important centers of mining, that we can neither expect to drive it out of the United States at short notice nor prevent its introduction upon a considerable scale into neighboring republics.

As the adoption of American processes and machinery means the abandonment of very large and costly reduction works, the Mexicans prefer to make their changes very gradually. In some cases, rock-crushers, operated by steam or horse-power, have been introduced to aid the Chilian mills in reducing the ores; in others, settlers of American manufacture have been added to increase the capacity of works, and in still others the crude retorts of home construction have been replaced by our iron barrel retorts.

The firm with which Mr. McDowell is connected have shipped to Mexico nearly one thousand American stamp mills, more than one-half of which are at work giving satisfaction. The mills sent have been of different types adapted to the ore and surroundings of the various mines.

The saving in time and cost of treatment which will be effected by these plants will increase the demand for American machinery, until it will be as universally employed as throughout the mining districts of the United States.

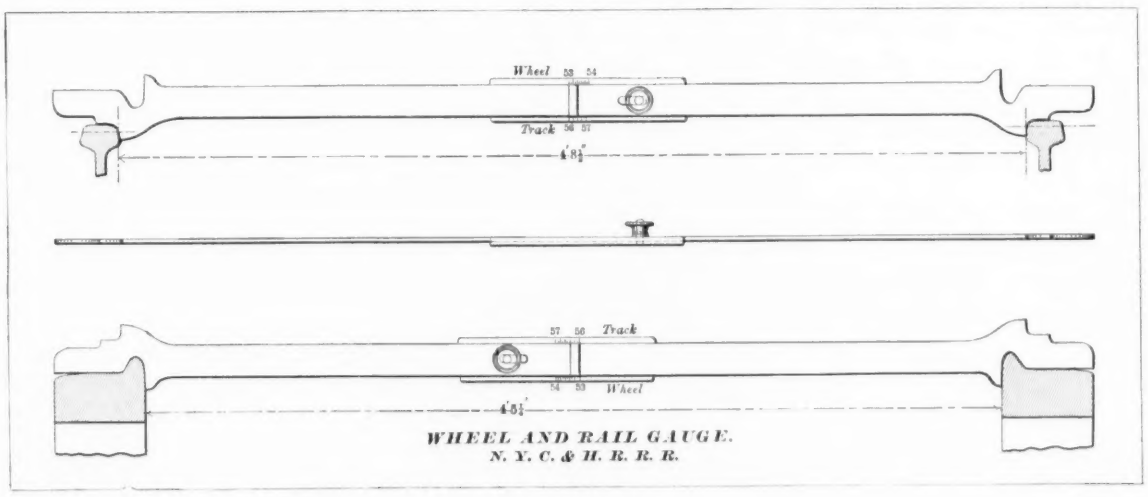
A Southern Machinist Becomes a Railroad General Manager.

Mr. Bradford Dunning, the New General Manager of the Baltimore & Ohio Railroad, is regarded as one of the ablest railroad men in the South. He has risen from the lowest step of the railroad ladder, having raised himself by the merit of trying to do everything well that he undertook. He commenced work as a laborer on the Eufaula Line in Alabama, and subsequently served an apprenticeship as machinist in the railroad shops. Step by step he rose in train service, till he attained the position of General Manager of the road, and brought it into prominence by persistently advertising throughout the country, "The Great Eufaula Line—eighty miles of good road under one management." His merits were recognized by the Louisville and Nashville Road, and he was appointed one of the division superintendents, and it is said that he spent so much time on the road, riding the soft (?) seats in the caboose that corns grew where he sat down instead of grass growing under his feet. Dunning is one of the railroad men that the lowest employe of the road will get as patient a hearing from as the best man in the country, and his particular delight is trying to better the lots of the hardest worked men in the company's service.

All who are able to judge say that the Baltimore & Ohio Railroad Company will derive substantial benefit from the management of Mr. Dunning.

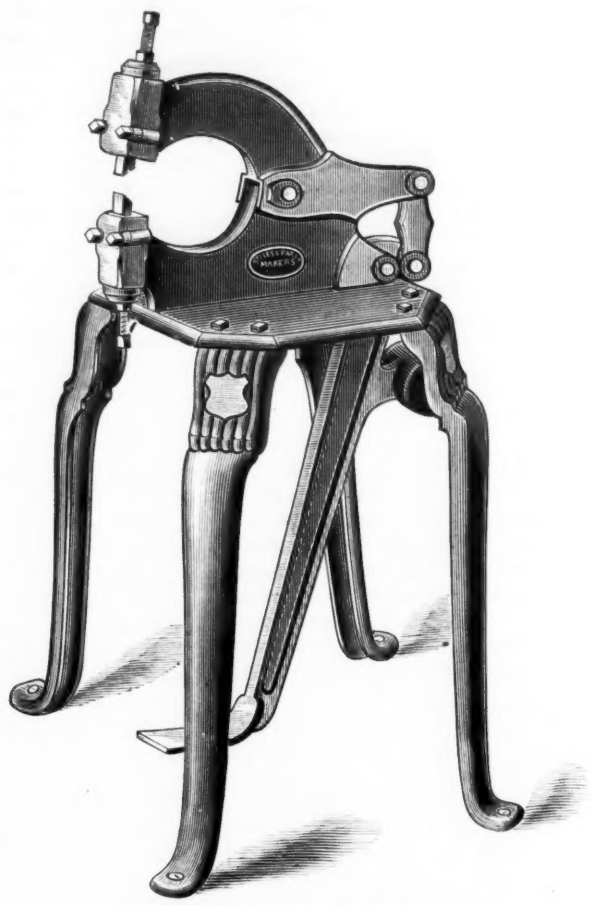
Wheel and Rail Gauge.

This important and convenient implement was designed by Mr. W. Buchanan, superintendent of motive power New York Central Railroad, and is provided to car inspectors and to the workmen who put car wheels on the axles. The flanges of cast-iron wheels vary so much in thickness that the current practice of gauging a wheel by taking the inside distance between the flanges often leads to inaccuracy that causes injury to the wheel. By the use of this gauge an inspector or workman can at once see how the tread of a wheel will touch the rail, and should a wheel flange be too thick, the exact discrepency can be measured by the graduated scale in the middle of the gauge. In the position shown in the cut one edge is right for measuring the wheel position, and the other edge is right for a track gauge. The slide in the middle permits the gauge to be moved in or out $\frac{3}{4}$ inch. The device is not patented.



WHEEL AND RAIL GAUGE.
N. Y. C. & H. R. R. R.

The superiority of the comparatively inexpensive American dredging machines was demonstrated in the construction of the Welland Canal, where the heavy costly Scotch machines were found of but little use. The same lesson, it seems, is being learned in the construction of the Panama Canal.


No. 2 BRASS FOUNDERS' SPRUE CUTTER.

No. 2 Brass Founders' Sprue Cutter.

The engraving represents this machine so clearly as to make but little in the way of description necessary. It is designed for use by brass founders and britannia manufacturers, etc., in cutting castings from gates, an operation which can be performed very rapidly by its use. The cutter being operated by foot-power, leaves both hands of the operator free to handle the casting. The frame has ample space back of the cutters, and is quite narrow across the throat, so that long castings set at any angle with the gate can be cut off as readily as short ones.

The cutters are made of $\frac{1}{2}$"x1" steel, and require no forging except to form the cutting edge. They are adjustable by screws to compensate for wear and for grinding. When the cutters are properly adjusted they cannot be brought into contact with each other to injure the cutting edges. They are furnished either with or without legs, by the Stiles & Parker Press Company, Middleton, Conn., and 59 Duane Street, New York City.

Convenient Engineering Works.

Describing the new Union Iron Works where Messrs. Shanks & Sons of Paisley, Scotland, carry on their business of machine tool making, at a recent social meeting the head of the firm said: "It may interest some of the ladies to know that the main building is 365 feet long—just a foot for each day in the year—70 feet wide and 50 feet high. There are 68 windows in it, each 36 feet high, and 8 feet wide. Then there is the smithy, boiler-house, engine-house, etc., and an office block, comprising public and private offices, drawing office and store, and, lastly, a room fitted up with a stove and every convenience for the use of the workmen at meal times. When I look back to the inconveniences of the old Bank Top Works, it appears a mystery to me how we ever got on there at all; and this is not my opinion only, for often I have heard our customers say that they could not understand how we managed to turn out the heavy work we did in such a building. This is now happily at an end, and our present works, I am proud to say, are greatly admired; indeed, so much favorable criticism has been expressed, that I think we have not spent our money and energy in vain. You will not, I hope, think it egotism when I tell you that many of our best customers have spontaneously remarked that it is the finest work of the kind they ever saw. Now, this may not be of much consequence to you as workers in it, yet still I cannot but think that to be employed in a work such as we possess is like living in a commodious house, against being pent up in a hovel, with confined air, little or no light, and all their attendant evils. I may here remark that we have adopted the electric light on the incandescent principle, which you are now all familiar with. This, in my opinion, is the light of the future; and just as gas superseded oil, so will electricity supersede gas, and the system we have adopted is certainly the one best suited for all inside illumination. Now-a-days a firm is not considered to be keeping pace with the times unless they have an installation of electric light, and our idea was to be in the forefront with this, as so much depends on how such a place as ours is lighted. Workmen cannot be expected to work in the dark; and in going through an establishment lit with gas, I cannot but remark the difference in the two systems of illumination. In the Union Iron Works the various departments are arranged so that the least possible amount of labor is entailed in getting the work done, and the appliances at our command are of the most modern and approved construction. To still further develop this department of our business, we are arranging a system of hydraulic lifting, that, we hope, will greatly facilitate the work being easily and rapidly pushed forward, and will in a great measure relieve the workmen from an amount of manual labor that in the discharge of their duties they have had to perform. This, however, should result in increased thought being given to the work. Under the old *regime*, when an apprentice entered the engineering establishment, he had to do a lot of what might be called hard work; but now with the aids machinery supplies, he finds quite a different condition of things."

Locomotive Engineers' Assembly.

Division No. 105 of the Brotherhood of Locomotive Engineers, whose headquarters are at Lexington Hall, Fifty-Ninth street, New York, held their annual ball in Tammany Hall on January 14. The arrangements were admirably carried out, and reflected much credit upon the officers; and a large and most respectable company were brought together for the evening. A great many veteran engineers sat round the stalls while the dancing was going on, and entertained themselves and auditors with stirring narratives of past engine running experiences. During the evening a working model of a locomotive was kept running by steam taken from the radiator. Alongside of this was also shown a handsomely finished working model of a compound vertical inverted marine engine made, in his leisure hours, by J. T. Taylor, an engineer on the Second Avenue Elevated Railroad. The officers of the division who conducted the arrangements were D. R. Cafferty, president; Levi Gibbs, vice-president; J. T. Taylor, secretary; J. D. Outwater, recording secretary, and E. J. Baker, treasurer. The comfort of the guests was enhanced by the kind attentions of J. C. Baker and J. D. Cameron, the reception committee.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Pres't.

JACKSON BAILEY, Vice-Pres't.

LYCURGUS B. MOORE, Treas. and Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

F. F. HEMENWAY, ANGUS SINCLAIR, } Mechanical Engineers.

The American News Company,

Publishers' Agents, New York.

The International News Company,

1 BOUVERIE STREET (Fleet Street), LONDON, ENG., will receive subscriptions for the AMERICAN MACHINIST, at 14/7 per annum, postage prepaid.

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NEW YORK, FEBRUARY 7, 1885.

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A Better Outlook for Business.

The general opinion of manufacturers of machinery, engines, boilers, and tools, who have called at our office within the last two weeks, is that business is improving. These favorable indications are further reinforced by reports by mail from different sections of the country. Many manufacturers that shut down in December have started up again, and the number of hands employed in industrial establishments is considerably in excess of what it was a month ago. The railroads generally report increased earnings, as compared with last year, which shows a greater volume of business. Prices of agricultural products and manufactured articles are so low that it would seem there could be but little probability of their going lower. As many new productive enterprises are made public as there were a year ago. There is a general disposition to prepare for an increase of general business, but an absence of disposition to make up large quantities of goods in advance of the demand. The recent large failure in the iron trade has caused less depression than might have been supposed. It is not likely that business will suffer through the adoption, during this session of Congress, of any foolish, one-sided reciprocity treaty, as the views of the mercantile community have been freely expressed against such action. The outlook for business in the machinery line is more encouraging than it has been for many weeks past.

An American Minister Speaking for a British National Policy.

The American Minister to England is popularly supposed to represent the Government of the United States and the institutions upheld by the Government, especially such as are integral parts of our national policy. He is supposed to be an exponent and defender of the American policy, both in his official and social intercourse. In order to properly maintain the dignity of his position as the representative of this Government, with its traditions and its foreign and domestic policies, he is paid a salary more than twice as great as the Vice-President of the United States, the Speaker of the House of Representatives, or any member of the President's cabinet. A recent cable dispatch, published in the daily papers, says that Mr. Lowell, the American Minister to England, presided one evening at a meeting of the Society of Arts, and delivered a lecture on "Labor and Wages in America," in which he "endeavored to show that the tariff in America had no influence on wages. He said workingmen were not likely to initiate free trade, and that the movement was more likely to be effected through internal competition." In the discussion that followed he said that "free trade would enable America soon to equal England's mercantile marine, which had heretofore been impossible through the operation of the American navigation law and tariff."

Inasmuch as Free Trade is the British policy, and Protection—its opposite—is the American policy, it must be admitted that Mr. Lowell is a better representative of British than of American institutions. Mr. Lowell should be recalled, and some American appointed to take his place who will upon every public occasion uphold and defend the distinctive institutions of his country.

New York Railroad Commissioners Increasing the Safety of Railroad Operating.

The Railroad Commissioners of New York have always displayed a laudable desire to induce the railroad companies throughout the State to adopt the most approved appliances that mechanical ingenuity has devised to secure safety to life and property in the operating of trains. The report of the Commissioners for 1884, just made to the Legislature, indicates that while its authors abate no part of their early zeal, they are improving in their methods of promoting travelers' safety. The condition of the railroad bridges throughout the State has been receiving constant attention, and the inspector of the board has personally examined many bridges and trestles. The board sent circulars to all railroad companies asking for drawings of all the truss bridges in use, also for strain sheets and details of the floor systems in use. A history of each structure was also called for. One of the first results of the circular was that managers began to find weak places in their bridges of which they had no idea before, and in many cases the bridges were strengthened before drawings and strain sheets were sent in to the board. The necessity of this work is particularly brought about by reason of the great increase in the weight of rolling stock within the last few years. There are many bridges still standing, built when the maximum weight of locomotive and tender was 55 tons, and the maximum weight of a freight car, with its load, was 19 tons. Locomotives with tender now frequently weigh 87 tons, and freight cars, with their loads, 35 tons. In the early days of bridge building, particularly of iron bridges, it was the habit to construct trusses of complicated form, the accurate calculation of the strains on which it is very difficult, and in some cases impossible, to determine. An approximation close enough for practical purposes is always reached, however. A better practice now prevails, and trusses of simple form, admitting of no ambiguity, are alone accepted by the best engineers. In exceptional cases, complex trusses have to be resorted to, but they are avoided as much as possible.

Much attention has been given by the board to automatic car couplers, automatic brakes, signals and other appliances calculated to promote the safety of trainmen. They wish railroad companies to be required to put a low railing on the sides of the tops of freight cars to prevent brakemen falling off. This would no doubt save many lives, but we consider the true remedy for this cause of accidents to be in the adoption of continuous brakes for freight trains. The mechanical details have been worked out, and nothing prevents railroad companies from adopting freight train brakes but the consideration of first expense. We deem it the duty of railroad commissioners and State legislatures to end the procrastination of railroad companies on this question, and compel them to adopt continuous freight brakes, since the improvement would prevent much human suffering. The change, when once made, would be more benefit to railroad companies themselves than to any other parties concerned.

The plan to have the spring meeting of the American Society of Mechanical Engineers on a Mississippi river steamboat on the way to the New Orleans Exposition, has been abandoned. It is probable that the meeting will be at Scranton, Pa.

Michigan Railroad Commissioners' Annual Report.

We have received a copy of the twelfth annual report of the Commissioner of Railroads of the State of Michigan from Mr. W. P. Innes, the Commissioner. The book contains a great deal of information about the business and financial condition of the railroads in Michigan, and some comments and statistics about operating and management. The part devoted to operating matters is noted for its mild character, and is so non-committal that the reader is impressed with the belief that the writer of the report was feeling his way over unknown ground, and afraid every step of falling into a mistake. This, of course, is a necessary result of appointing politicians as railroad commissioners, instead of practical railroad men.

From the report, it appears that two railroad companies in Michigan have adopted interlocking switches and signals to protect their crossings on grade. The list of fatal accidents indicates that the use of intoxicating liquors is freely practised by the citizens of Michigan, and that when they get full a favorite resort is a railroad track. In the list of killed, 54, out of a total of 163, were trespassers, and 30 of the trespassers were intoxicated. The Legislature is recommended to pass laws prohibiting people from using railroads as promenade ground.

Impecunious Railroad Companies.

The New York Railroad Commissioners do not entertain the opinion that unlimited competition is the life of trade. The war of rates brought on by the New York, West Shore & Buffalo Railway, serves as a text for the following sermon: "There is lack of wisdom on the part of the State in permitting any 13 men who can secure subscriptions of $1,000 per mile, with ten per cent. thereof paid in, to build a railroad anywhere they see fit without an expression from the State of the public exigency of the same. A railroad cannot be built without the State delegating to its promoters the highest power it possesses over property—the right of eminent domain—the right to take private property for public uses. The State itself never exercises this sovereign power except in cases of public necessity. Why should it delegate it to any 13 men to be exercised for mere private gain, frequently at the expense of vested rights and grave public interests? When the State has undertaken the control of railroads by the creation of supervisory boards, and has determined to exact the highest standard of service at reasonable rates of freight and fare, it would certainly seem as if a corresponding obligation rested upon it to protect existing railroads from useless and disastrous competition by unnecessary new ones. A road struggling along with disastrous competition with an unnecessary parallel road pleads poverty and financial inability to comply with every recommendation of the board, looking to better maintenance or more convenient operation. Even those measures absolutely necessary for the safety of travel are often neglected, and when recommended by the board strenuously resisted upon the ground that the road is not even earning fixed charges. The objection is unanswerable when made to recommendations for more convenient or agreeable maintenance, but is not accepted by the board as a reason for not complying with recommendations to insure the safety of travel."

Learning a Trade.

A correspondent writes us that he is 17 years old, and is desirous of learning some trade that, while it takes time to master, will in the end yield good wages. He asks our opinion as to what trade he should learn, and especially mentions that of pattern making—how long time it will take to learn it, and if acquaintance with special studies, such as geometry, is necessary. These are questions, in different forms, that are frequently asked, and that are not easily satisfactorily answered.

As a rule, the highest wages are paid in those trades that are the most difficult of mastery, and the ability to master a trade should have something to do with the advisability of attempting to learn it. This, however, is a difficult and delicate question to decide upon. But while in some trades less wages are as a rule paid than in others, there is in any of them always "room at the top," with good wages for those who get there.

The pattern maker's trade is a good one for those who have the industry and perseverance to thoroughly master it, which implies a good deal more than will be learned in the workshop. The pattern maker should know a good deal of geometry, some of which he may learn from books, but more of which, so far as he is concerned, he must invent. Just the same can be said of the trade of machinist, or moulder, or boiler maker. In all trades those who read and study hard are reasonably sure to succeed; to succeed as a pattern maker, especially, requires study, as the pattern maker is likely to be employed where he is the only one of the class about the works, and if he has enough of the right kind of knowledge is recognized as an important man, and usually commands good wages.

Our correspondent, and all others, had

better learn the trade they have the most inclination for, and work hard to learn it well; as for the rest, it will take care of itself.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(43) **S. C., who inquires about the pitch** diameters of worm wheels, will find his question answered by means of a cut in the AMERICAN MACHINIST of Sept. 1, 1883.

(44) **Rust, Washington, D. C., asks:** Can you give me the proportions of the materials used in making a rust joint? *A.*—Take of sal ammoniac 1 part by weight, flour of sulphur 2 parts, and iron borings 80 parts.

(45) **H. E., Clinton, Iowa, asks:** In a locomotive engine, which guides and which side of the cross-head wears the most, and why? *A.*—In running ahead the wear is on top guides and top of crosshead, because the strain on the connecting-rod is in the direction to lift the crosshead.

(46) **J. S., Nashville, Tenn., asks:** 1. In calculating the horse-power of a belt, from which pulley do you figure the speed of belt, the driver or driven? *A.*—It is immaterial. The speed in feet per minute will be the same, no matter from which pulley you figure. 2. We have a 16-foot pulley with 28″ belt running to a 5-foot pulley; revolutions per minute, 73. How much power is transmitted through belt? *A.*—We cannot tell how much power *is* transmitted. If pulleys are, say, about 30 feet apart, we should say 150 horse-power *could* be transmitted with a double belt.

BUSINESS SPECIALS

Transient Advertisements, 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Curtis pressure regulator and st'm trap. Jan. 10, p. 11.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass

"How to Keep Boilers Clean." A book mailed free, by James E Hotchkiss, 86 John street, N. Y.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

The Young Engineer's Own Book, $3. Edw. Meeks, Publisher, 1002 Walnut St, Phila., Pa.

For Sale—26″ b. g drill presses, quick ret'n, bal. spindles, new, modern tools, $150. S. M. York, Clev'd, O.

Power Measured—F. Van Winkle, mechanical engineer, 22 Cortlandt street, New York.

Acoustic telephones and magneto call bells, only $15 a set. W. E. Lewis, Corry, Pa.

Castings for 1½ H.P. Stationary or Yacht Engines. Send for description. J. A. Walker, Watertown, N. Y.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York

Universal grinders for lathe-centers, chucks, angles, or cylinders. C. C. Hill, 84 Market st., Chicago, Ill

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Cooper, On the Use of Belting, $3.50. Edw. Meeks, Publisher, 1002 Walnut St., Phila., Pa.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Split Pulleys at low prices, and of same strength and Appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham St., N. Y.

Farley's Reference Directory of the Machinists, Iron, Steel, and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

Dixon's Plumbago Facing or Blackening. Competition is everywhere driving foundrymen to produce smoother castings. This can be well and cheaply done by the use of Dixon's Plumbago or black lead as a blackening or facing. Jos. Dixon Crucible Company, Jersey City, N. J.

Locomotive Engine Running and Management. By Angus Sinclair. Price $2. An excellent book for men interested in steam engineering, valve setting, designing valve motion, the care of the Westinghouse brake, etc. Published by John Wiley & Sons, 15 Astor Place, N. Y.

MANUFACTURES.

Charles Dewey has reopened his machine shops in Goldsboro, N. C.

H. S. Holdridge will soon establish a machine shop at Hawkinsville, Ga.

A. Geiss will erect a four-story factory at 951 West Madison Street, Chicago, to cost $10,000.

The Chicago Screw Driver Works have lately been filling orders from a house in London, England.

W. H. Kehoe & Co., Savannah, Ga., will rebuild their foundry which was lately damaged by fire.

It is reported in Natchez, Miss., that a foundry and agricultural implement works will be started.

Watt & Call, 1518 Franklin Street, Richmond, Va., will rebuild their agricultural implement manufactory.

The Plymouth (Mass.) Cordage Company will rebuild their mill recently burned. Steam power will be used.

The Eberhard Manufacturing Company, Cleveland, Ohio, will increase its capital stock from $200,000 to $400,000.

Thos. Hunter & Co., will erect on Bergen Street near Vanderbilt Avenue, Brooklyn, N. Y., a one-story brick workshop, 25x95 feet.

The machine shops of the Sheffield & Birmingham Railroad, to be constructed during the next 12 months, are to be erected at Sheffield, Ala.

Francis Keil, 163 East 53d Street, New York will build a brick iron foundry, 31x100 feet, with extension 10x50 feet, on 163d Street, to cost $6,000.

William H. Eddy, Worcester, Mass., has completed a new automatic machine for making lag screws, which works with rapidity and accuracy.

Boynton & Plummer, Worcester, Mass., are about to issue a new catalogue of their blacksmiths' drills, bolt cutters, and milling machines, for hand and power.

The Raleigh and Gaston Car-Wheel Foundry, Raleigh, N. C., will erect a car-wheel foundry 65x80 feet, of brick and iron, one story high. There will be two cupolas.

W. F. Kornegay & Company will locate their large foundry and machine shops, lately burned, on West Center Street, Goldsboro, N. C. Buildings are being erected.

E. M. Jewett, Swan and Washington Streets, Buffalo, N.Y., will rebuild his barrel works lately burned It will cost about $40,000 to erect the works, which will employ 100 hands.

S. W. Goodyear, Waterbury, Conn., writes us that the year starts with some inquiries for wire-pointing machines that promise business. The first half of 1884 was good; last half dull.

The Pennsylvania Railroad Company has entered into arrangements with F. W. Richardson, Troy, N. Y., for using the Richardson balanced slide valve on all their locomotives.

R. Hollings & Company, Gas Fixture Manufacturers, 547 Washington Street, Boston, Mass., are building a brick manufactory on Troy Street near Harrison Ave., Boston, to cost $40,000.

Thomas Brantley, formerly of Eufaula, Ala., writes us from Fort Valley, Ga., whither he has moved to take charge of the new machine shop now building for Miller, Sawyer & Co.

Currier & Snyder, Worcester, Mass., are about to bring out another size and style of upright drilling machine. They make an exclusive specialty of drills, and are meeting with excellent success.

A stock company is being formed for the establishment of extensive plow works at Hagerstown, Md. It is proposed to absorb a company now in operation at Mangansville, Washington county.

The S. Ashton Hand Manufacturing Company has been established at Toughkenamon, Pa., for the manufacture of machinery and tools. S. Ashton Hand is superintendent and treasurer of the Company.

Munson, Hayden & Company, Malleable Iron Works, Columbus, Ohio, have just completed a 113x65-foot addition to their works, in which they have an improved air furnace with ten tons a day capacity.

The Solvay Process Company, Syracuse, N. Y., manufacturers of carbonate of soda, recently had their works damaged considerably by explosion. They will repair the damage and build an extension to the works.

Weston & Smith, designers and builders of light machinery and tools, Syracuse, N. Y., have moved into more commodious quarters in the screw company's building, and have increased their facilities for turning out work.

The Pond Machine Tool Company, Worcester, Mass., are running ten hours a day, and report business prospects as looking brighter. We noticed in their shop, one day last week, a newly-designed 48″ engine lathe, with a bed 37 feet long, which weighs, complete, 16 tons. The shears are flat. It has 15 changes of speed. Upon being started up, the gears ran very smoothly, with very slight noise.

The Foxborough (Mass.) Manufacturing Company for making sewing machines, etc., has been organized with a capital of $150,000. J. E. Abbot, president; R. F. Boyden, 2d, treasurer; W. T. Cook and V. S. Pond, directors.

The Iowa Iron Company, of Dubuque, Iowa, have lately added a fourteen-foot boring machine, by the Niles Tool Works, to their establishment. They are busy at present on marine and stationary engines and steam pumps. Their force will be increased this week.

The National Iron & Brass Company, of Dubuque, Ia., builders of the excelsior steam pumps and improved drill presses, are doing a fair business. They have lately sold several of their pumps to parties in New Orleans, and last week shipped one of their drill presses to parties in Prairie du Chein, Wis.

Rockwell & Cranmer, Monroeton, Pa., builders of sawmills, engines, and agricultural implements, have all the work they can do, and are talking of building a large brick shop during the coming summer. One of the men in their shop writes us: "We haven't seen anything of hard times as yet."

The Mount Sterling Iron Fence Foundry and Machine Company will shortly erect a foundry at Mt Sterling, Montgomery county, Ky., on the C. & O. Railway, at foot of Syracuse Street, for the purpose of making iron fences. R. T. Bean, President; A. H. Judy, Treasurer; Lewis Apperson, Secretary.

The J. L. Perry Manufacturing Company (Limited), formerly the Bennett Manufacturing Company, of Watertown, Wis., has been incorporated for the purpose of building and carrying on a foundry and machine shop. Capital stock, $50,000 J. L. Perry, J. B. Bennett and J. S. Bennett, incorporators.

Some citizens of Phœnixville are endeavoring to start a stove foundry at that place. They propose to erect suitable buildings for the purpose, and then lease them to practical parties acquainted with the business. One gentleman of the place offers to be one of 20 persons to erect the necessary buildings. *Industrial World.*

The American Cotton Oil Company, 2 William Street, New York, will erect a mill for making cotton seed oil at the corner of Hamilton Avenue and Smith Street, Brooklyn. It will be 92x60 feet, and four stories high. They will also erect a one-story frame shed adjoining the mill, 103x113 feet. The works will cost $64,000.

The Estey Piano Company, of New York City, has been incorporated for the purpose of manufacturing pianos in New York City. Capital stock, $60,000. Jacob Estey, Col. Levi K. Fuller, John B. Simpson, Jr., Robt. Proddon, Stephen Brambach, trustees Col. Fuller is vice-president of the Estey Organ Company, Brattleboro, Vt.

Randolph Brandt, 38 Cortlandt St., manufacturer of the Selden packing, both with and without rubber core, has recently brought out a new style of square braided packing, which, it is said, by those who have used it, possesses peculiar merits. He manufactures self-lubricating packing for steam and water, in great varieties.

The Novelty Iron Works, of Dubuque, Iowa, have just completed for parties in Wilmington, N. C., an immense sand pump to be used in dredging the river at that point. They are at present busy on steam gang sawmills and their improved stationary engines. They claim at present to be doing the largest business of any firm in Iowa.

The Stiles & Parker Press Company, Middletown, Conn., and 59 Duane Street, New York, have brought out a new machinists' tool grinder. The grinder is a corundum wheel, and the frame is hollow, forming a reservoir for water, and is fitted with a self-acting pump for forcing the water to the wheel. A truing-up fixture goes with the machine.

Jerome Moltz, Williamsport, Pa., has purchased the Bushong furnace property in that city, and is erecting thereon machine shops and foundry, which he informs us will be in running order the first part of February, prox. He has ordered the machinery from the New Haven (Conn.) Manufacturing Company.

A new circular has been issued, containing a lot of flattering testimonials from the users of the Korting exhaust steam induction condenser. It has been applied successfully to plain slide valve engines, automatic cut-off engines, and marine engines on the Lakes. The circular can be had from A. Aller, 109 Liberty Street, New York.

The new illustrated catalogue of machinists' tools made by F. E. Reed, Worcester, Mass., shows several new sizes of lathes not presented in his former catalogues, also a new milling machine, of which two lots have been sold to the U. S. Armory at Springfield, Mass. It shows a cut of Mr. Reed's new factory, which has 22,900 square feet of floor room, and is well equipped with new machinery througout.

The Humphreys Manufacturing Company, a new company, has nearly completed a new machine shop at Mansfield, Ohio. It will be ready to start soon after the first of February. The product will be brass and iron pumps, hydraulic rams, etc. The shop will be fitted with new tools, among them seven upright drills, which Prentice Brothers, of Worcester, Mass, will finish by February 1. The manager of the works is John Humphreys, Jr, formerly of Goulds Manufacturing Company, and the Silver & Deming Manufacturing Company.

L. Coes & Co., Worcester, Mass, are preparing to offer an improved style of Coes' genuine screw wrench. The ferrule and frame of handle are cast in one piece. It is impossible for the wrench to get away from the handle when in use, unless the tool is broken up. The contingency of handle splitting is entirely avoided. The wood part of the handle consists of a piece on each side, like the sides of a jack-knife handle. These pieces are fastened by two rivets put through the handle, and in case they are broken can easily be replaced by others.

The E. Horton & Son Company, Windsor Locks, Conn., have issued a new illustrated catalogue and price-list of Horton lathe chucks, of which several styles are made, adapted to different uses. Several new sizes and styles have been added during the past year, among them an improved car wheel chuck (illustrated in the AMERICAN MACHINIST some weeks ago), of which they make a 5″ size and a 22″ size, with both three and four jaws, also a 5″ and 22″ combination chuck, both three and four-jawed, besides several sizes for cutting-off lathes.

J. H. Williams & Co., manufacturers of iron and steel drop forgings, Brooklyn, N. Y, issue a circular announcing that W. H. Brock, of Corona, L. I., has consolidated his business interests with theirs. Additional facilities are thereby acquired, with an increase of machinery, valuable patents, and Mr. Brock's personal services and supervision. Among the articles of manufacture will be Brock's chain pipe wrench, illustrated in our columns some weeks since. Their line of forged single and double end wrenches is constantly increasing in size and variety, and a full assortment of lathe dogs, shafting collar forgings, etc., will be kept on hand.

The co-partnership existing for some years past between Stephen A. Morse, Carlton M. Williams and Edwin F. Morse, under the firm name of Clem & Morse, builders of elevators, Philadelphia, Pa., will hereafter be conducted by the same partners under the firm name of Morse, Williams & Company. Mr. S. A. Morse will superintend the mechanical and manufacturing department; Mr. Williams the books and finances, and Mr. E. F. Morse the contracting and erection of work as heretofore. This personal supervision of the various departments will enable the firm to guarantee their customers the best attention, and a continuance of the high standard of excellence that has characterized the work in the past.

The Continental Iron Works, Greenpoint, Brooklyn, N. Y., have erected machinery for welding the longitudinal seams in steam boilers, and for tubes of large diameters, designed by Geo. S. Strong, of Philadelphia, and constructed by the Port Richmond Iron Works of that city. This machine when in operation will have the capacity to weld a seam nine feet long at a single heat. Another machine has been designed by Mr. Strong to weld the transverse seams on boilers that is intended to weld entirely around a seam at a single heat, thereby making it possible to have an entire shell without a riveted seam. The same parties are also constructing a corrugating mill to manufacture corrugated furnaces for steam boilers.

The Bridgeport Boiler Works, Bridgeport, Conn., have lately received several good orders for boilers and other work, which will keep their full force of hands at work for some time. There are two orders for all-steel marine boilers, 1 vertical and 1 horizontal for medium-size steam oyster boats now building for parties in Norwalk and Rowayton, Conn., and an order for a pair of Lowe boilers five feet diameter, fitted with the improved front and furnace, for the fine, new building of Hanan & Son, corner of Center and White Streets, New York City. They have lately shipped a pair of 5 ft. Lowe boilers to parties in New Haven, Conn., and a 6 ft. one to parties in Williamsburg, N. Y., all steel, which weighed 10 tons, and was carried over the Brooklyn Bridge. All these boilers are fitted with the improved front and furnace.

A decision was rendered by the Supreme Court of the United States, January 19, in the two patent cases of the Consolidated Safety Valve Company, appellant, against the Crosby Steam Gage and Valve Company, appeals from the Circuit Court of the United States for the District of Massachusetts. This court reverses the decision of the Massachusetts court. These were suits brought by the appellant against the appellee for alleged infringement of two patents granted to George W. Richardson, Sept. 25, 1866, and Jan. 19, 1869, for certain improvements in safety valves. The defence set up for the Crosby Company was want of novelty in Richardson's alleged inventions. The court below held the defence good and dismissed the Consolidated Company's bills of complaint on the ground that Richardson's patents were invalid. This court reverses that decision, and holds that Richardson's inventions had not been anticipated by others, and that he was "the first person who made a safety valve which, while it automatically relieved the pressure of steam in the boiler, did not, in effecting that result, reduce the pressure to such an extent as to make the use of the relieving apparatus practically impossible because of the expenditure of time and fuel necessary to bring up the steam again to the proper working standard." His patents are held by this court to be valid; the valves made by the Crosby Company are declared to be an infringement, and the decrees of the circuit court are reversed, with directions to award an account of profits and damages on the patent whose term has expired since this suit began, and to award a perpetual injunction on the other patent. Opinion by Mr. Justice Blatchford.

A company has been formed for the establishment of a new industry in this city—the manufacture of the Jewel sewing machine. The following is the organization: President, D R. Lock; Vice President, Wm. Baker; Secretary and Treasurer, F. T. Lane; General Manager, H. F. Pettingill; Superintendent, G. F. Danielson. It is proposed to erect suitable buildings at once, with a capacity for the employment of 200 hands.—*Toledo (O.) Commercial Telegram.*

Machinists' Supplies and Iron.

NEW YORK, January 22, 1885.

A ramble round the dealers in supplies does not impress one with the belief that the trade conditions are entirely satisfactory, but amidst much outspoken complaint of hard times, there comes out the fact that enquiries are increasing, that the prospects are fair, and that the point of lowest prices has been passed.

Iron—The Great Pittsburgh failure has exercised a depressing influence on operations in pig, but the effect is expected to be temporary. In fact an impression prevails that the failure will have a beneficial effect' for it is understood that the company has for some time demoralized prices by underselling the lowest in the desperate attempt to raise funds to meet accumulating liabilities. In one respect the failure may have done serious harm, since it is said to have broken the back of the labor market This would result in keeping prices on the downward grade, and no return of prosperity is possible till the ascent is reached. There have been small sales of standard brands of No. 1 X Foundry at $18 to $18.50: No. 2, $17 to $17.50 at tidewater, and Grey Forge, at furnace, $14.50 to $15.50.

Scotch pig has ruled dull and nominal, the sales being insignificant Prices only indicate a point that sellers will not go far below. We quote Shotts $21.50 to $21.75, to arrive; Coltness, $21.50 to $21.75, to arrive; Glengarnock, $19.50, to arrive; Gartsherrie, $20.50; Summerlee, $20.50; Cambroe, $19. to arrive; Eglinton, $18.50; Langloan, $21; Dalmellington, $19.

Antimony—There has been no quotable change in the value of Regulus. The demand continues moderate and the tendency of the market in buyers' favor. We quote Hallett's brand 10 cents, and Cookson's 10.40 cents.

Copper—Ingot has been quiet and steady at 11 to 11¼ cents for Lake, and 10½ to 10¾ for other brands.

Lead—Common pig has been weaker during the week than it was at the time of our last report. Sales of considerable magnitude have been made at 3.65 cents, but it was difficult to get that price.

Tin has ruled firm. For jobbing lots we quote Banca 19c; Straits and Malacca, 17c.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

An experienced engineer desires a position as chief draftsman or superintendent. Address N. S. S., AM MACHINIST.

Traveling salesman, with two years' experience, wishes a position to travel. Best of references furnished. Address "B," AM. MACHINIST.

A young man, with experience as machinist and draftsman on a large variety of work, wants position as draftsman. Machine tools a specialty. Address F. A. Foster, Box 2144, Aurora, Ill.

Wanted—A traveler; must be posted in steam engines, and some experience in traveling. Good salary and permanent employment to the right man. No other need apply. Address "Governor," AM. MACHINIST.

Wanted—Position as manager, superintendent or designer, by Mechanical Engineer who has had a technical education and ten years' practical experience in mechanical work and the above positions. Best references. Ad Box 15, AM. MACHINIST.

A new and valuable patent for permutation door and padlocks. A simple and perfect invention. For sale low. Call and examine. Tuttle & Sheldon, 265 Broadway, N. Y.

Wanted—A machinist of experience and some means, to take charge of, and interest in, a small jobbing shop in New York City. Address M. C., AM. MACHINIST.

For Sale—A nickel-plated Richards indicator, with two springs. In perfect order and but little used. Cheap. Apply to "H.", G. M. I. Works, Bath, Me.

Wanted—One second-hand iron lathe, in good order, of 48" or 50" swing, and bed about 8 ft. long, for boring and turning. State price. American Machine Works, Detroit, Mich.

For Sale—Foundry and Machine Shop in city of 3,500 inhabitants. No competition east or west for 100 miles. On St. Louis Air Line R. R. This can be bought at a bargain. Address James B. Gamble, Princeton, Indiana.

A good machinist, who can command from $7,000 to $8,000, can secure a first-class opening in an established business in Montreal. Address for particulars, Hanson Bros., Financial Agents, etc., 178 St. James Street, Montreal, Canada.

BOILER SHOP TOOLS WANTED.

Wanted, outfit for small boiler shop: power punch, shears and rolls, and pneumatic or steam riveter. New or second-hand. Address

P. O. BOX 324, CHICAGO, ILL.

COOKE & CO., DEALERS IN

Machinery & Supplies,

22 CORTLANDT ST.,

NEW YORK.

AGENTS FOR THE

Greenfield Vertical Engines,

2½ to 30 Horse Power.

Unequaled in workmanship and quality of material. Prices lower than any other first-class engine.

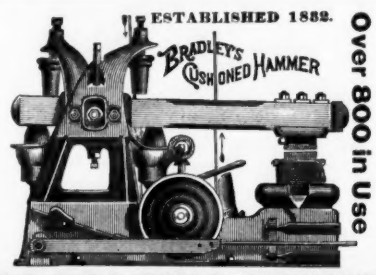
ALSO

SUPPLIES

For Machinists, Railways, Mills, Mines, &c.

Please send for circular and state that you saw the advertisement in this paper.

ESTABLISHED 1882.



Over 800 in Use

BRADLEY'S CUSHIONED HAMMER.

Stands to-day without an Equal.
It approaches nearer the action of the Smith's Arm than any Hammer in the WORLD.

BRADLEY & CO., Syracuse, N. Y.

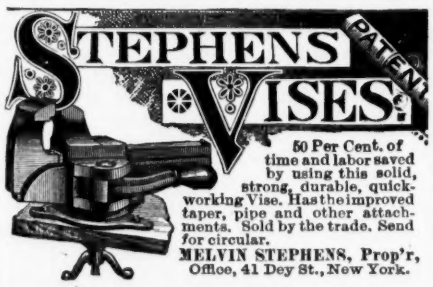
THE BROWN HAMMER

STRIKES A BLOW WITH

DOUBLE THE VELOCITY That it Raises the Hammer.

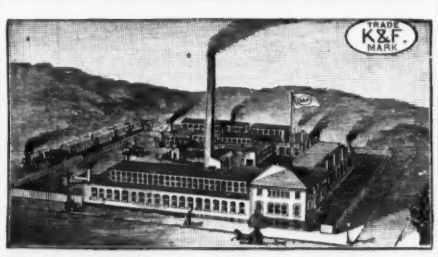
A NEW MOVEMENT! SEND FOR DESCRIPTION.

KNOWLTON MFG. CO., King St., Rockford, Ill.



50 Per Cent. of time and labor saved by using this solid, strong, durable, quick-working Vise. Has the improved taper, pipe and other attachments. Sold by the trade. Send for circular.

MELVIN STEPHENS, Prop'r, Office, 41 Dey St., New York.



KEARNEY & FOOT CO., File Mfrs., 101 Chambers St., N. Y.

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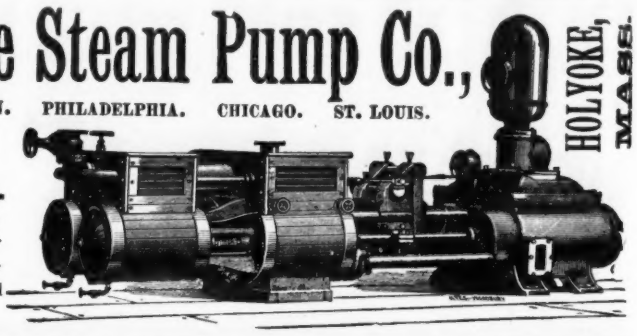

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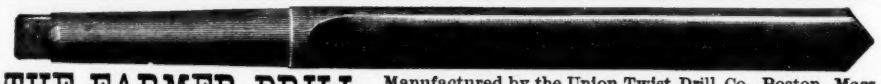

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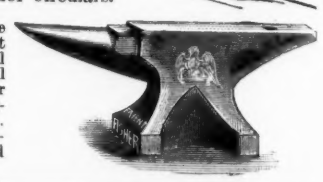

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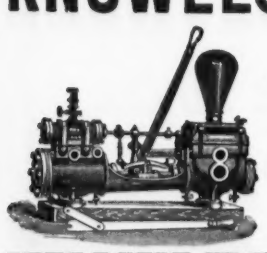

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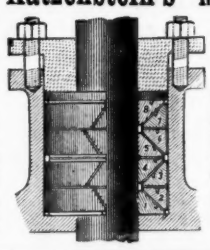

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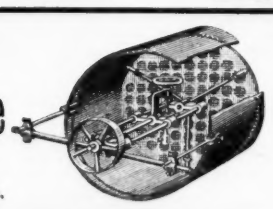

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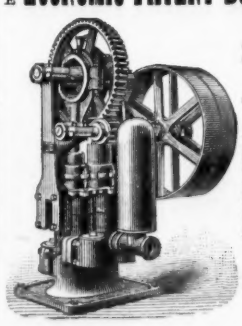

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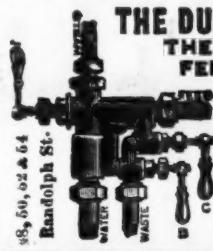

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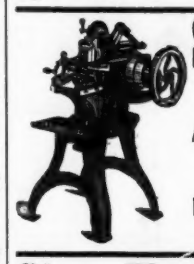

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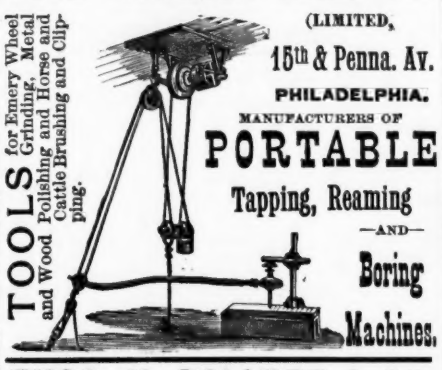

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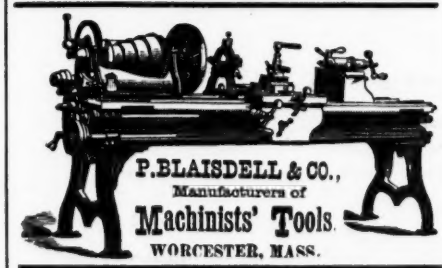

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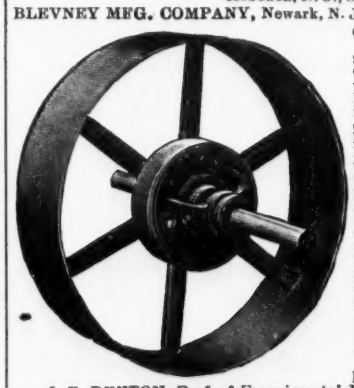

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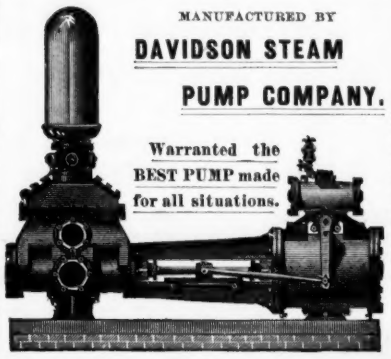

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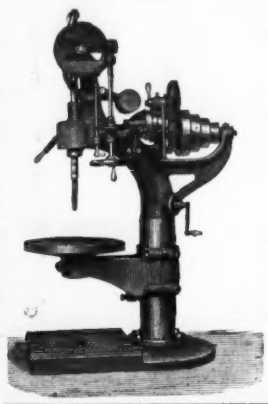

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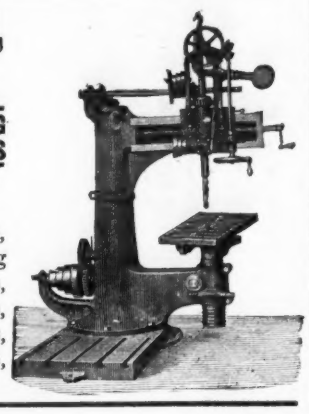

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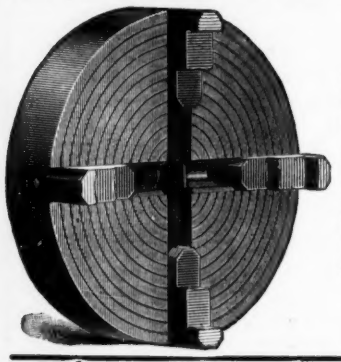

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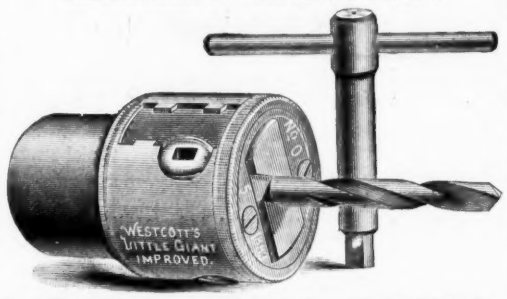

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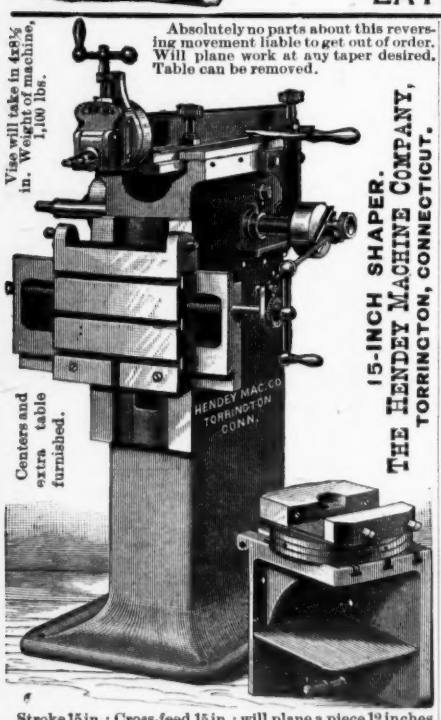

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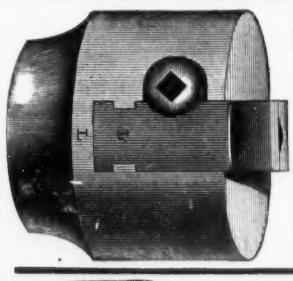

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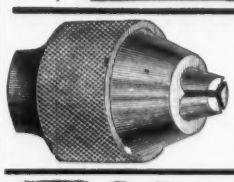

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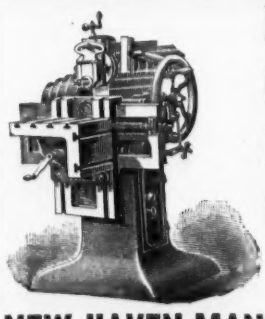

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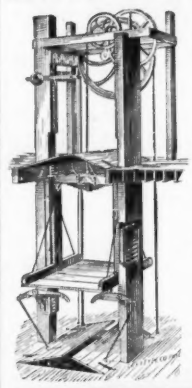

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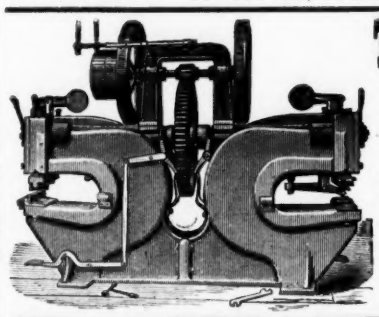

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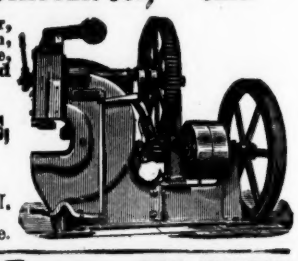

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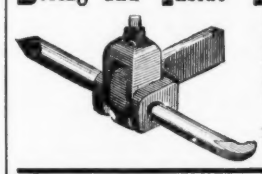

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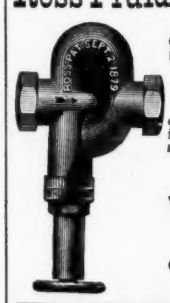

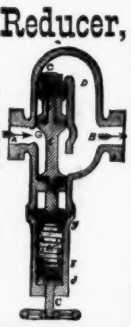

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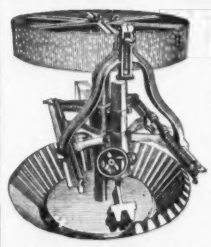

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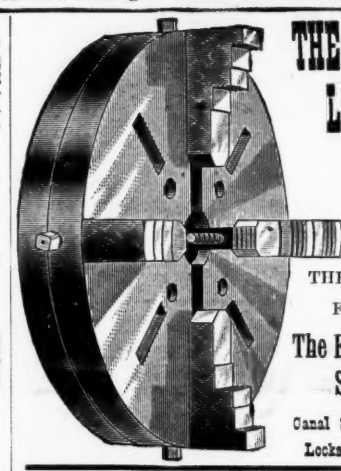

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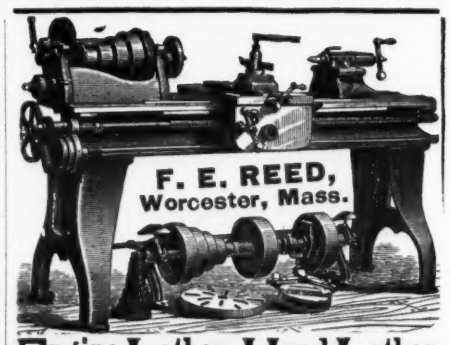

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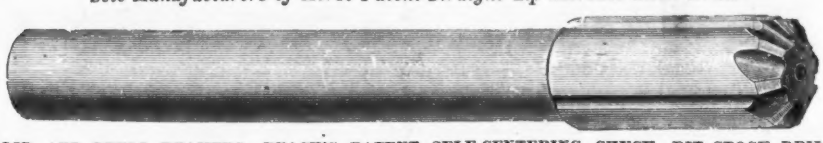

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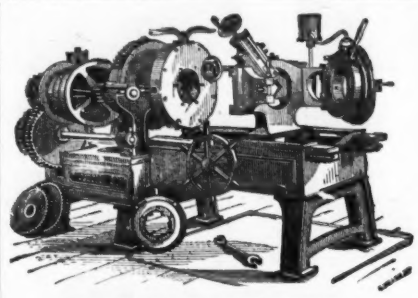

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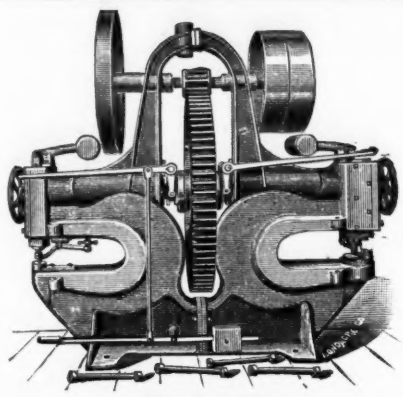

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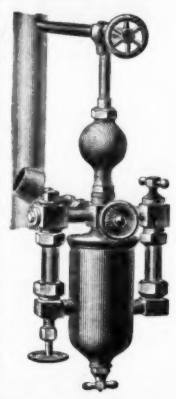

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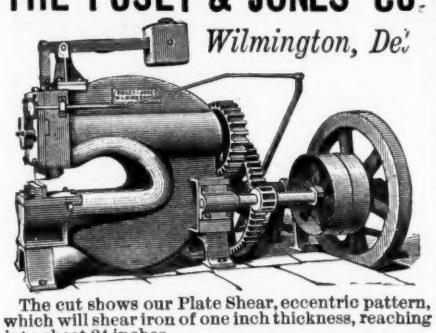

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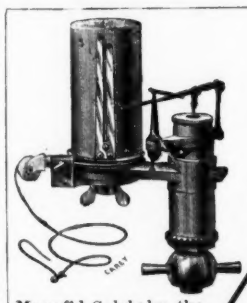

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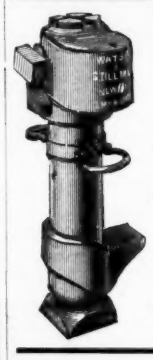

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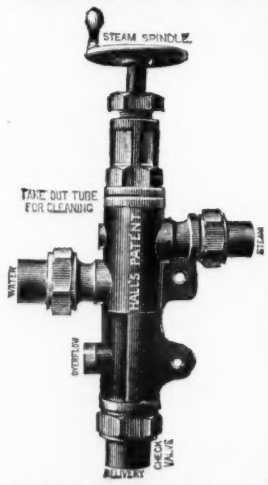

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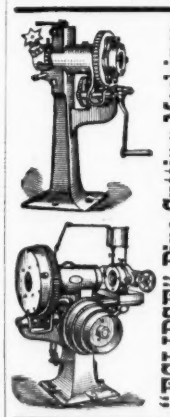

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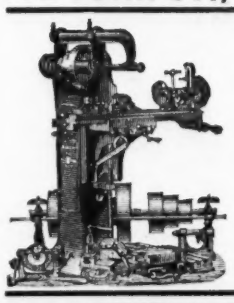

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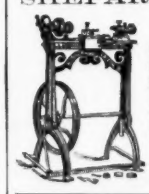

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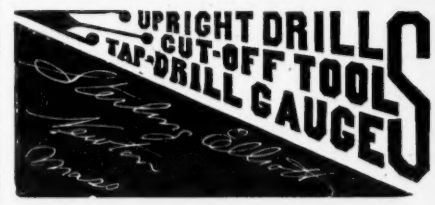

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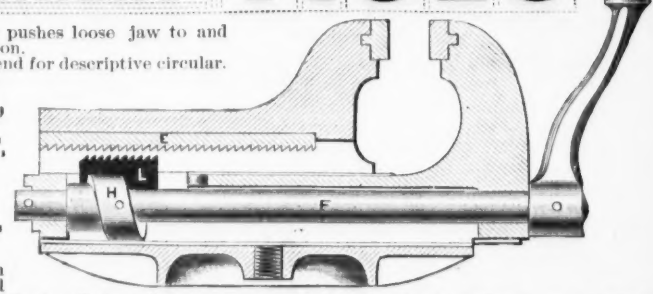

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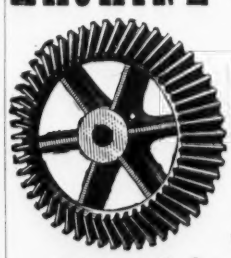

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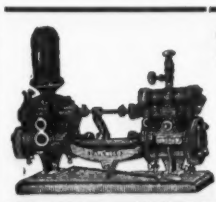

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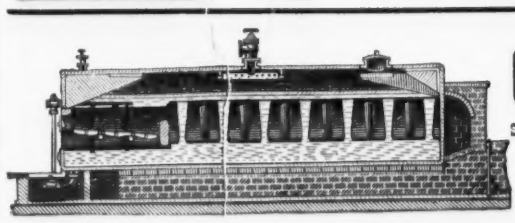

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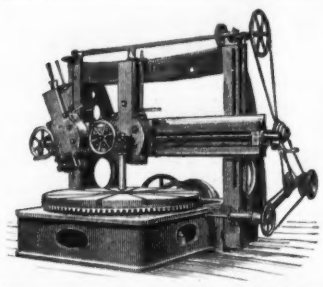

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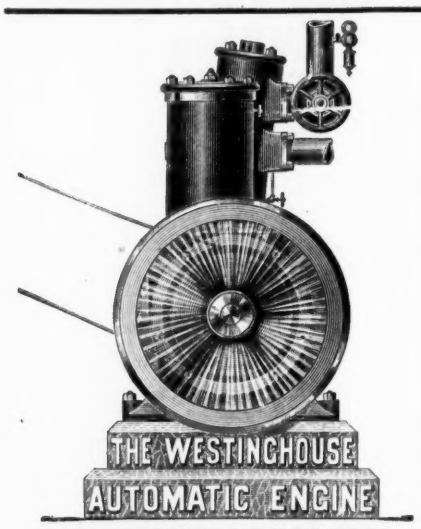

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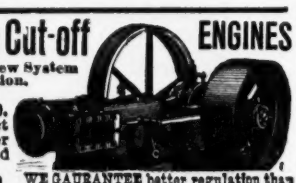

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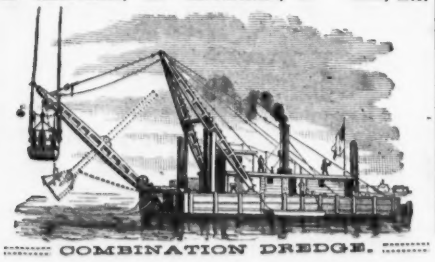

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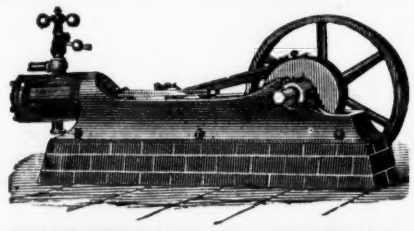

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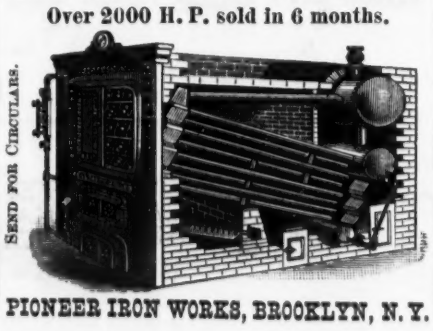

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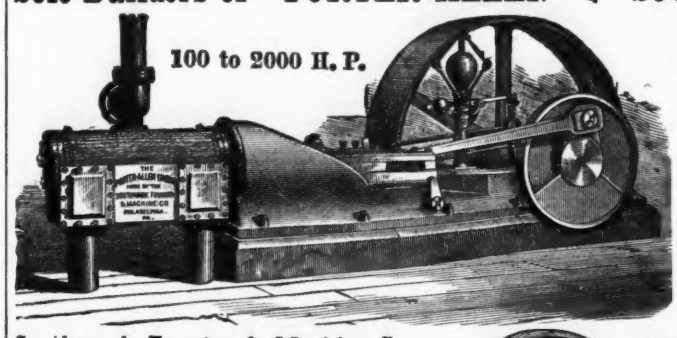

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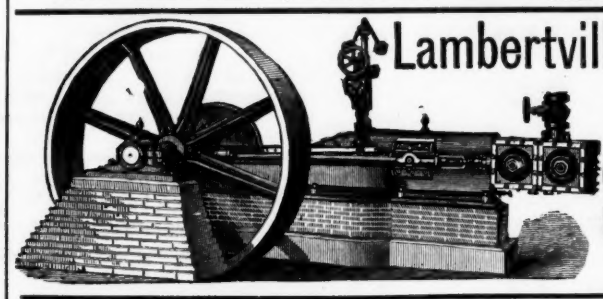

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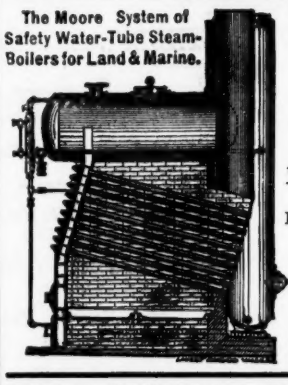

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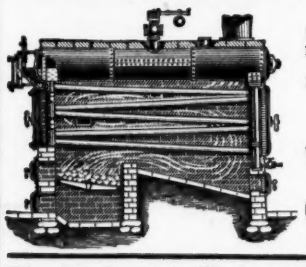

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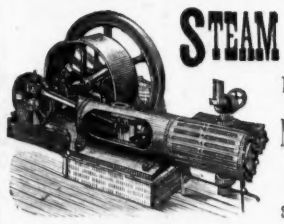

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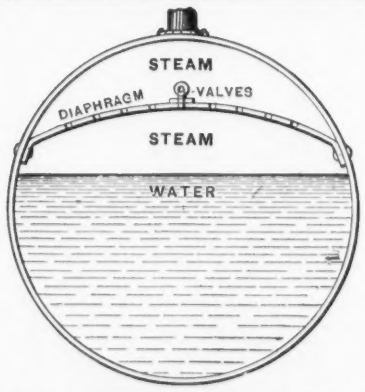

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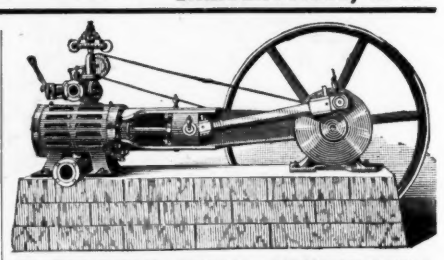

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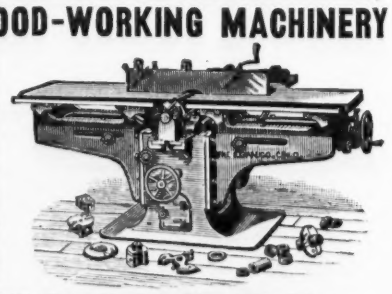

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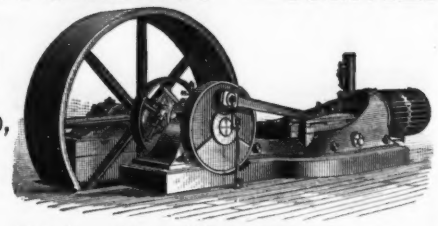

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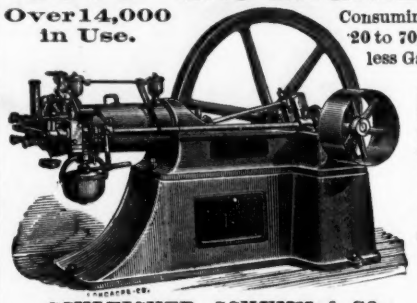

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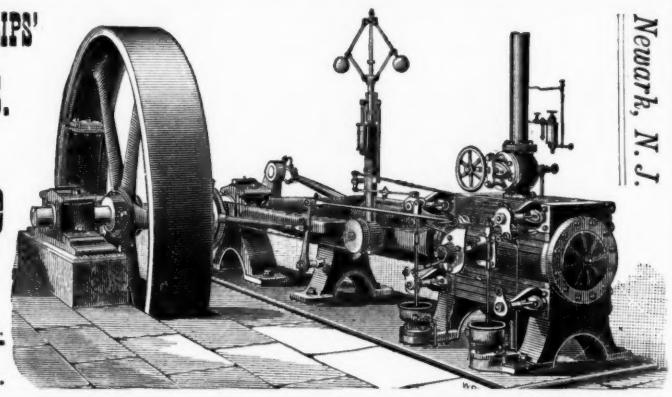

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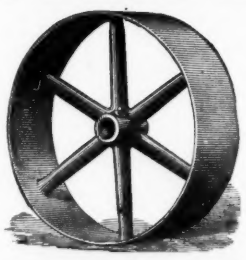

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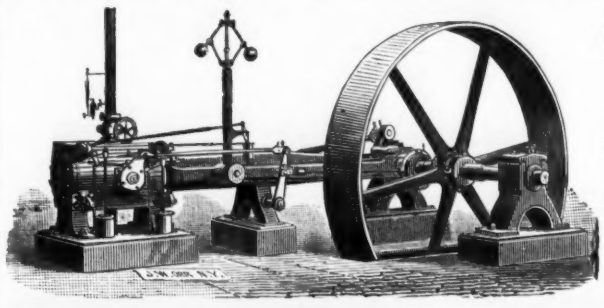

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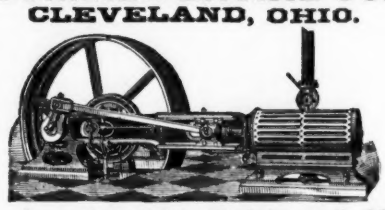

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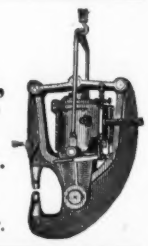

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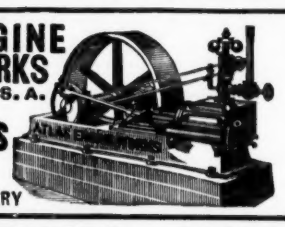

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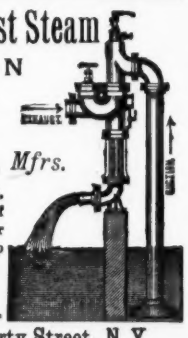

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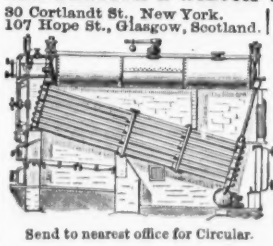

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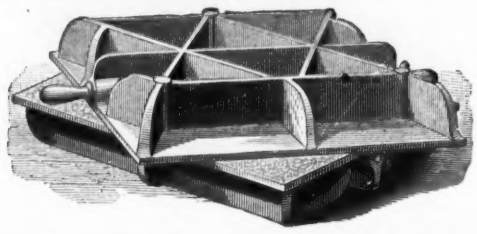

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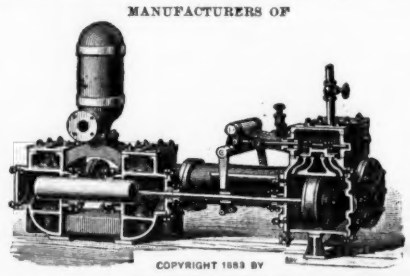

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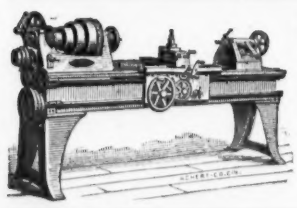

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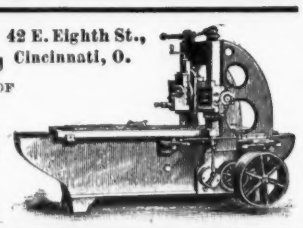

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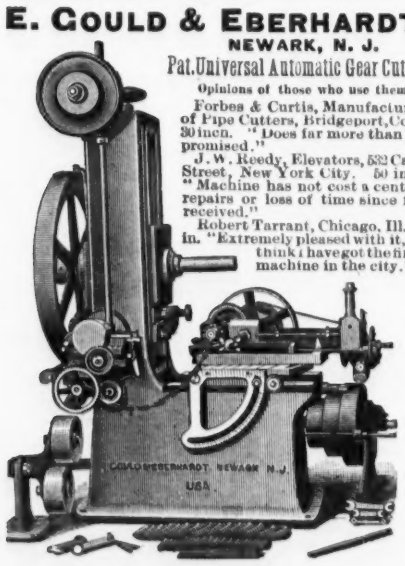

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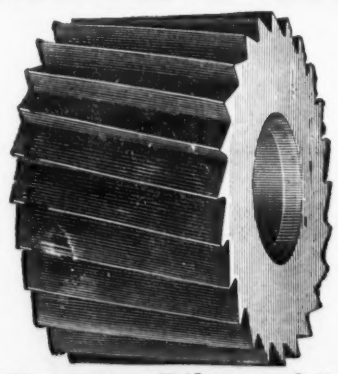

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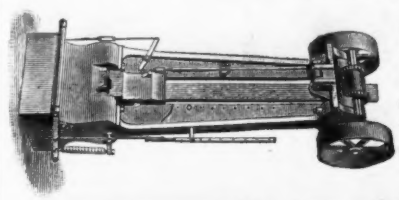

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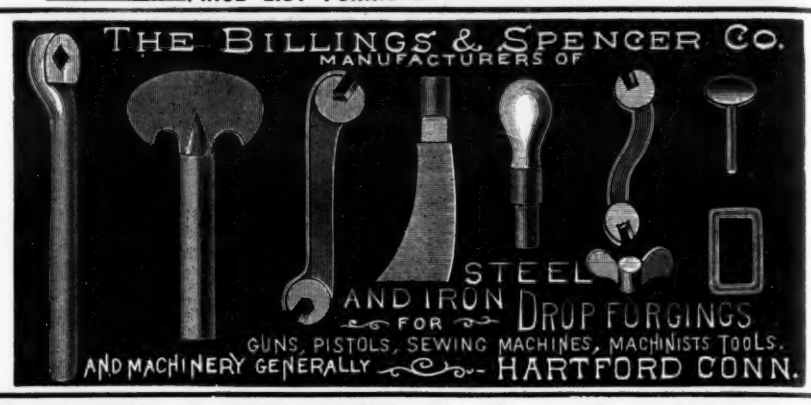

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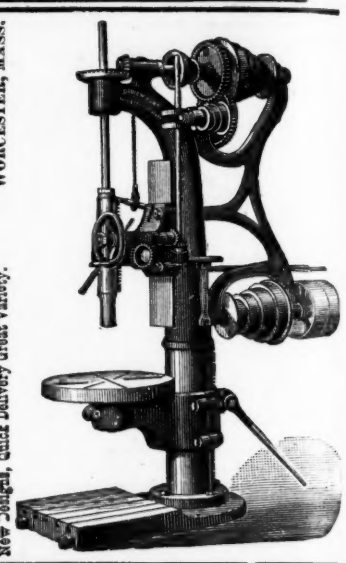

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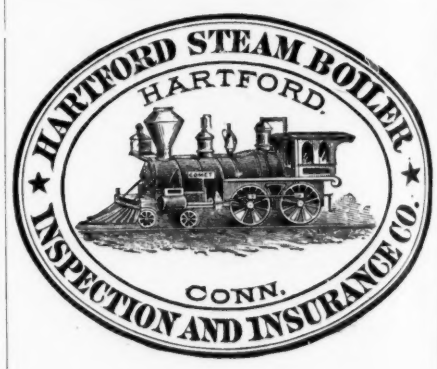

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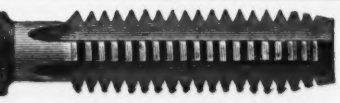

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